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Latest trends in medical education during COVID pandemic: a cross sectional study

Últimas tendencias en educación médica durante la pandemia de COVID: un estudio transversal

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Abstract

Introduction**:* Parallel to past technological revolutions, along with existing pandemic crises has made digitally assisted tools, and formats for e-learning an essential component of medical Curriculam. This current study objectives were to find out the opinion of the students about the use and efficacy of the distance learning tools during the Covid-19 crises and its impact on learning and academic achievements among medical students of Saudi Arabia. ***Methods: Cross-sectional study was conducted among 1021 medical college students of Saudi Arabia by developing a survey questionnaire composed of sociodemographic characteristics of participants, study habits assessment including teacher engagement and student-teacher interactions, assessment of distance teaching approaches such as availability of internet services at home, the usefulness of live sessions or recorded videos, number of hours one can attend the sessions and stay motivated, assessment of academic performance, evaluation of respondents experience and technical infrastructure, psychosocial assessment of respondents, and their coping with COVID-19 crises. ***Results:*** Among 1021 students, 503 (49%) were males and 518 (51%) females. 64% agree that distance teaching tools used by the teachers were easy to understand and use, and 55% responded that they are very much satisfied with E-learning provided by their institute. There was no significant difference observed between students on the usefulness of different approaches in facilitating learning experience except 'Self-study using text and/or video materials provided by the teacher approach' (P=0.043). ***Conclusion:*** The findings showed satisfactory results, showing that Saudi Arabia's respective medical universities offered good online support and orientation to overcome COVID 19 crises, and students found distance learning tools easy to use and understand as the support provided by the medical universities staff. Future steps would be taken based on the observed results, and further improvement would be implemented to make the learning process easier for medical students.

Keywords: Assessment, COVID-19, E-learning, education, medical students.

Resumen

Introducción: Paralelamente a las revoluciones tecnológicas pasadas, junto con las crisis pandémicas existentes, ha hecho que las herramientas y los formatos asistidos digitalmente para el aprendizaje electrónico sean un componente esencial del currículo médico. Los objetivos de este estudio eran averiguar la opinión de los estudiantes sobre el uso y la eficacia de las herramientas de aprendizaje a distancia durante las crisis de Covid-19 y su impacto en el aprendizaje y los logros académicos entre los estudiantes de medicina de Arabia Saudí. ***Métodos:*** Se llevó a cabo un estudio transversal entre 1021 estudiantes universitarios de medicina de Arabia Saudí mediante la elaboración de un cuestionario compuesto por las características sociodemográficas de los participantes, la evaluación de los hábitos de estudio, incluido el compromiso del profesor y las interacciones entre estudiantes y profesores, la evaluación de los enfoques de la enseñanza a distancia, como la disponibilidad de servicios de Internet en el hogar, la utilidad de las sesiones en directo o de los vídeos grabados, el número de horas que se puede asistir a las sesiones y mantenerse motivado, la evaluación del rendimiento académico, la evaluación de la experiencia de los encuestados y la infraestructura técnica, la evaluación psicosocial de los encuestados y su afrontamiento de las crisis de COVID-19. ***Resultados:*** De 1021 estudiantes, 503 (49%) eran hombres y 518 (51%) mujeres. El 64% estaba de acuerdo en que las herramientas de enseñanza a distancia utilizadas por los profesores eran fáciles de entender y utilizar, y el 55% respondió que estaba muy satisfecho con el E-learning proporcionado por su instituto. No se observaron diferencias significativas entre los estudiantes en cuanto a la utilidad de los distintos enfoques para facilitar la experiencia de aprendizaje, excepto el "enfoque de autoaprendizaje con materiales de texto y/o vídeo proporcionados por el profesor" (P=0,043). ***Conclusión:*** Los hallazgos mostraron resultados satisfactorios, demostrando que las respectivas universidades médicas de Arabia Saudí ofrecieron un buen apoyo y orientación en línea para superar las crisis de COVID 19, y los estudiantes encontraron las herramientas de aprendizaje a distancia fáciles de usar y entender como el apoyo proporcionado por el personal de las universidades médicas. A partir de los resultados observados, se tomarán medidas futuras y se introducirán nuevas mejoras para facilitar el proceso de aprendizaje a los estudiantes de medicina.

Palabras clave: *Helicobacter pylori*, resistencia antimicrobiana, placa dental.

Introduction

Worldwide the coronavirus disease (COVID-19) has impacted medical students. Medical students want to be prepared to provide the best healthcare services, but in the present world, this starts with finding the best way to educate them. This begins with understanding the opportunities that professors, teachers, and medical college authorities have at their fingertips and using all the resources, considering the barriers that COVID-19 has created. Social distancing is the most effective strategy of prevention since COVID-19 emerged pending the discovery of a vaccine, medication, or both. This makes it difficult for students to meet in learning classrooms, lecture halls, or nice community areas[1,2]. Most teachers have been flipping the classrooms past few year's by providing "anytime / anywhere" individualized training for interactive learning. Nonetheless, students still gathered for small-group activities, laboratory sessions, simulations, and technology sessions (e.g., bedside ultrasonography sessions), as well as clinical guidance for standardized patient procedures and practical patient care environments[3].

Many e-learning and online learning resources and methods have been addressed in the literature as valuable tools and methods to expand the teaching and learning possibilities in the medical health profession. It was evident that e-learning in terms of the gain of information and performance of students is equivalent to traditional classroom methods. E-tools represent the language of future generations. In response to COVID-19, the faculty of medical education quickly moved the entire program to electronic formats. Small-group configurations convene online in virtual team environments, and clinical expertise sessions may take place online or may be postponed in certain situations. Examinations have also shifted to electronic setups[2]. More than ever, digital education in problem-based learning, or digital problem-based learning (DPBL), is increasingly being used in education in the health professions. DPBL involves both solely digitally mediated and mixed problem-based learning, incorporating interactive and face-to-face learning. It mandates that Saudi Arabia's educational institutions shift their educational model from embracing technology to changes in instruction and pedagogy[4]. Display quotations of over 40 words, or as needed.

Updating content material may be a boost to the online environment, and virtual activities may seem usable, but the outcome of these changes will require periodic assessment and evaluation. Saudi Arabia's medical institution's preparations should be extensively studied in terms of their technical, technological, and psychosocial capacities and growth to cope with this trend. This transition from the medical school environment to home results in loneliness, increased email usage, and challenges to establish boundaries between work and home that can really affect teachers and students[3].

Therefore, this research paper is intended to explore and assess the changing pattern of the education system affecting the learning style and academic performances of medical students of Saudi Arabia during times of pandemic. This study will not only be appropriate to address the educational issues effectively for medical students of Saudi Arabia during this current crisis but will also help to lay the groundwork for teaching in future disasters and beyond. Hence this study was carried out with an aim to study to explore and assess the impact of the COVID-19 global pandemic crisis on changing educational patterns of medical students in Saudi Arabia.

Materials and methods

Sample and Recruitment

This cross-sectional study was carried out from June to October 2020 among various medical schools all over Saudi Arabia. Presently there are about 37 medical schools with approximately 250-300 students overall in each. With a confidence level of 95% and a population of 10000, the sample size was calculated to be 1200. Following the creation of the questionnaire, the questionnaire was forwarded for review to a biostatistician and a medical education specialist. Pretested questionnaire was distributed in various medical schools situated in Northern, Southern, Western, and eastern regions.

The alpha of Cronbach was determined for the entirety of items in this sample and was suggesting strong internal consistency. A self-administered questionnaire was made accessible online as a weblink to all the students. The study participants included second to six-year students comprising of both males and females. Informed consent was obtained from each participant registered to the survey—the questionnaire contained five sections with a total of 36 items. A total of 24 questions were formulated using the 5-points Likert scale, a total of 3 questions based on Yes/No, remaining 9 were open questions. Ethical approval was sought from the ethics committee, Deanship of scientific research, Majmaah University.

We overlook to assess different parameters that affect medical students during the pandemic time including get the opinion of students regarding online classes, agreement levels of students on live sessions, tools, materials, technical difficulties, agreement level of students on their comfortability with online classes, and distress caused due to COVID 19, testing availability of functioning internet service "networking technology" at home helping you for distance teaching, identify a maximum number of hours one can stay motivated and follow the session, we explore institute's online support and orientation regarding COVID-19 pandemic crisis,

examine the ability of students to concentrate at home while studying, identify different suitable E-Learning method usefulness among medial students, assess different approaches in facilitating learning experience and success and finally examine different between academic year and genders among medical students.

Data analysis

The sample size was computed by using SPSS program version 21.1 for Windows (SPSS, Inc, Chicago, IL, USA). Chi-Square test used in our survey for correlation coefficient to determine the relationship between the various variables. Statistically important is a p-value less than ≤ 0.05. Privacy and confidentiality were maintained throughout the duration of the study.

Results

There were 1021 medical students from various universities across the country who participated in this study; of them, 503 (49%) were males and 518 (51%) females. Most of the students were single 1004 (98%), 9 were married, 5 were separated, and 3 were divorcee. The majority of the students belonged to the western region, 467 (46%) and very less from the northern region 65 (6%). Students from all academic levels were included in the study except the first year. Final-year students were high in the number who responded 289 (28%), followed by fifth-year students 189 (19%), second-year 184 (18%), fourth-year 181 (18%), and least were from 3rd year 178 (17%). The mean age of male participants was 22.40 ± 1.9 and female 21.81 ± 2.1 (**Table I**).

Table II depicts the majority of the students were happy with the teacher's transition from offline classes to online classes. 31% of the students were neutral when asked about the interaction received by the tutors before the launching of online classes. About 50% of the students agreed that 'they know what the teachers expect them to do in their courses' while few students (22%) disagred. A majority of the students (52%) believe that there is too little interaction between teachers and students with the online classes. There was a significant difference in student's opinions observed of the different academic year on their amount of work they have to do at the moment (p- value 0.039). 52% of the students felt that College made an appropriate change when shifting to online study.

The majority of the students (25%) strongly agree and (40%) agree that 'the tools used for distance teaching provided by university learning management system were effective and appropriate. 64% agree that distance teaching tools used by the teachers were easy to understand and use. Few students (7.6%) experienced a lot of technical difficulties during live sessions. About 37% kept neutral while responding to 'Did assignment and homework enhanced their learning' while only 8% of them responded they strongly agree. Overall, 55% responded that they are very much satisfied with the E-learning provided by their institute. About 46% of the students disagree that 'their sleep deprivation negatively affected their study preparedness. 40% agreed that they experienced some sort of psychological distress during the online learning and the Covid19 situation, about 60% distracted by social media, and 45% were distracted by COVID 19 crisis news (**Table II**).

The majority of the students had functioning internet services (80%) at their homes which help them for distance teaching, and 2% did not have internet service. Only 2.4% of the students said they could stay motivated for more than 4 hours and follow the session, and 30% said 'it depends upon the teacher.' 69% said 'their institutes provide them online support and orientation regarding the COVID19 pandemic crisis. About 35% of the student's said 'they are not able to concentrate at home while studying (**Table III**).'

Student's opinions on the usefulness of different E-learning methods were also asked. There was a significant difference of opinion observed between students of different academic years on the use of 'Blackboard learn' P value <0.01. 21% of the 6th year students said 'Not used,' and about 8% of the 5th year students said the use of Blackboard was useless. The majority of the student's found Zoom technology to be a useful tool for E-learning. Of the total 6th year students, 68% of them said 'it is a useful tool. Of the total, 33% of them were either neutral or said 'not used (**Table IV**).' There was a significant difference observed with regard to the use of Microsoft teams (p value <0.01). Only 10% of the

Table I: Sociodemographic characteristics of the study participants.

Characteristics	Frequency	Percent
Gender		
Male	503	49.3
Female	518	50.7
Marital status		
Single	1004	98.3
Married	9	0.9
Separated	5	0.5
Divorced	3	0.3
Current geographic residence		
Western region	467	45.7
Southern region	75	7.3
Central region	273	26.7
Eastern region	141	13.8
Northern region	65	6.4
Academic level		
2nd Year	184	18.0
3rd Year	178	17.4
4th Year	181	17.7
5th Year	189	18.5
6th Year (Final Year)	289	28.3
Total	1021	100.0
Mean Age ± SD		
Male	22.40 ± 1.9	
Female	21.81 ± 2.1	
Total	22.10 ± 2.0	

3rd year students found 'Microsoft teams' useful while it was 28% in 5th year students. There were differences of opinions among students observed with regard to the use of 'Moodle' and 'Email' for the E-learning method with P values <0.01 (**Table IV**).

There was no significant difference between students observed on the usefulness of different approaches in facilitating learning experience except 'Self-study using text and/or video materials provided by the teacher approach' (p-value 0.043) (**Table V**).

Table VI depicts the mean scores of 8 dimensions. There was no statistically significant difference of mean scores of 9 dimensions (Opinion on online classes) and mean scores of 8 dimensions (opinion on live sessions, tools, materials, technical difficulties, etc.) observed in students of different academic years. However, there was a highly significant difference in mean scores observed with regard to opinion on comfortability with online classes and distress caused due to COVID19. Third-year students had high average scores of 3.31±0.51, and fourth-year students had fewer scores of 3.13±0.51 (p -value0.01) (**Table VI**).

Table II: Student's opinion on various aspects (live sessions, tools, materials, technical difficulties, comfortability, and distress due to COVID19.

Dimensions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Student's opinion on online classes						
Overall, I feel the teachers are doing their best to smooth the transition from (offline) classroom teaching to (online) distance teaching under the current circumstances (COVID-19)	50 (4.9%)	88 (8.6%)	177 (17.3%)	425 (41.6%)	281 (27.5%)	1021 (100%)
You are satisfied with interaction received before the commencement (launching) of the online classes by the tutor(s):*	60 (5.9%)	149 (14.6%)	313 (30.7%)	368 (36.0%)	131 (12.8%)	1021 (100%)
I know what the teachers expect me to do in their courses	47 (4.6%)	174 (17.0%)	278 (27.2%)	372 (36.4%)	150 (14.7%)	1021 (100%)
I think there is too little interaction between the teachers and students at the moment	51 (5.0%)	213 (20.9%)	221 (21.6%)	329 (32.2%)	207 (20.3%)	1021 (100%)
I wish I would receive more feedback from the teachers on how much progress I make	44 (4.3%)	121 (11.9%)	220 (21.5%)	374 (36.6%)	262 (25.7%)	1021 (100%)
I feel overwhelmed by the amount of work I have to do at the moment*	81 (7.9%)	155 (15.2%)	257 (25.2%)	293 (28.7%)	235 (23.0%)	1021 (100%)
I think my college made an appropriate change when shifting to online study*	87 (8.5%)	120 (11.8%)	182 (17.8%)	380 (37.2%)	252 (24.7%)	1021 (100%)
I could maintain my concentration on study materials while attending lectures while studying from home	120 (11.8%)	212 (20.8%)	185 (18.1%)	317 (31.0%)	187 (18.3%)	1021 (100%)
I practiced good time management, which helped me achieve my academic goals	94 (9.2%)	161 (15.8%)	243 (23.8%)	337 (33.0%)	186 (18.2%)	1021 (100%)
Student's opinion on live sessions, tools, materials, technical difficulties, etc						
The live session is better than the recorded session	115 (11.3%)	152 (14.9%)	238 (23.3%)	241 (23.6%)	275 (26.9%)	1021 (100%)
Overall, the tools used for distance teaching provided by university learning management system (E-Learning), e.g. (Blackboard Learn, Zoom, Microsoft teams, Webex, Moodle, Email, etc.) are effective and appropriate	47 (4.6%)	69 (6.8%)	238 (23.3%)	409 (40.1%)	258 (25.3%)	1021 (100%)
In general, the distance teaching tools used by the teachers are easy to understand and use	29 (2.8%)	78 (7.6%)	253 (24.8%)	445 (43.6%)	216 (21.2%)	1021 (100%)
I experience a lot of technical difficulties during live sessions	161 (15.8%)	300 (29.4%)	269 (26.3%)	213 (20.9%)	78 (7.6%)	1021 (100%)
In general, the live sessions are too long	42 (4.1%)	238 (23.3%)	338 (33.1%)	259 (25.4%)	144 (14.1%)	1021 (100%)
My academic performance positively influenced by the changes in curriculum due to Covid-19 pandemic	111 (10.9%)	145 (14.2%)	296 (29.0%)	275 (26.9%)	194 (19.0%)	1021 (100%)
Assignments and homework enhanced my learning*	143 (14.0%)	186 (18.2%)	374 (36.6%)	233 (22.8%)	850 (8.3%)	1021 (100%)
Overall, I am satisfied with E- Learning provided by my institute:*	75 (7.3%)	121 (11.9%)	261 (25.6%)	378 (37.0%)	186 (18.2%)	1021 (100%)
Students opinion on their comfortability with online classes and distress caused due to COVID 19						
I have enough sleep hours	71 (7.0%)	171 (16.7%)	191 (18.7%)	318 (31.1%)	270 (26.4%)	1021 (100%)
I have sleep deprivation negatively affect my study preparedness*	159 (15.6%)	309 (30.3%)	253 (24.8%)	225 (22.0%)	75 (7.3%)	1021 (100%)
I experienced some sort of psychological distress since the start of online learning and the Covid19 situation (depressive symptoms, obsessive-compulsive behavior, etc.)*	166 (16.3%)	219 (21.4%)	225 (22.0%)	246 (24.1%)	165 (16.2%)	1021 (100%)
Most likely I am able to study alone at separate room:	34 (3.3%)	74 (7.2%)	143 (14.0%)	417 (40.8%)	353 (34.6%)	1021 (100%)
Most likely i am forced to study at shared room:	263 (25.8%)	365 (35.7%)	207 (20.3%)	131 (12.8%)	55 (5.4%)	1021 (100%)
I become distracted by social media or other entertainment*	54 (5.3%)	127 (12.4%)	216 (21.2%)	362 (35.5%)	262 (25.7%)	1021 (100%)
I become distracted by COVID-19 crisis news	133 (13.0%)	202 (19.8%)	231 (22.6%)	287 (28.1%)	168 (16.5%)	1021 (100%)

Table III: Availability of internet services, motivation, online support, and concentration at home while studying.

Characteristics		Frequency	Percent
Do you have available functioning internet service "networking technology" at home (WIFI, data bundle) helping you for distance teaching?	Yes, Effective Yes, But not effective Not at all effective	819 178 24	80.2% 17.4% 2.4%
Considering the live sessions you have had so far: what is the maximum number of hours you can generally stay motivated and follow the session?	< 1 hour 1 hour 2 hours 3 hours 4 hours > 4 hours I cannot really tell; it depends on the teacher	109 164 188 95 37 25 403	10.7% 16.1% 18.4% 9.3% 3.6% 2.4% 39.5%
My institute provides online support and orientation regarding the COVID-19 pandemic crisis:	Yes No	709 312	69.4% 30.6%
Are you able to concentrate at home while studying?	No, I get distracted Yes, I concentrated well Total	355 666 1021	34.8% 65.2% 100%

Table IV: Usefulness of suitable E-Learning method.

	Useless	Neutral	Not used	Useful	Total
Blackboard Learn					
2nd Year	26 (14.1%)	42 (22.8%)	32 (17.4%)	84 (45.7%)	184 (100%)
3rd Year	29 (16.3%)	28 (15.7%)	20 (11.2%)	101 (56.7%)	178 (100%)
4th Year	28 (15.5%)	37 (20.4%)	17 (9.4%)	99 (54.7%)	181 (100%)
5th Year	15 (7.9%)	43 (22.8%)	29 (15.3%)	102 (54.0%)	189 (100%)
6th Year (Final Year)	37 (12.8%)	68 (23.5%)	61 (21.1%)	123 (42.6%)	289 (100%)
Total	135 (13.2%)	218 (21.4%)	159 (15.6%)	509 (49.9%)	1021 (100%)
Chi-Square, P-value			29.407, 0.003		
Zoom					
2nd Year	8 (4.3%)	38 (20.7%)	33 (17.9%)	105 (57.1%)	184 (100%)
3rd Year	8 (4.5%)	30 (16.9%)	35 (19.7%)	105 (59.0%)	178 (100%)
4th Year	20 (11.0%)	29 (16.0%)	32 (17.7%)	100 (55.2%)	181 (100%)
5th Year	10 (5.3%)	29 (15.3%)	33 (17.5%)	117 (61.9%)	189 (100%)
6th Year (Final Year)	12 (4.2%)	42 (14.5%)	40 (13.8%)	195 (67.5%)	289 (100%)
Total	58 (5.7%)	168 (16.5%)	173 (16.9%)	622 (60.9%)	1021 (100%)
Chi-Square, P-value			20.433, 0.059		
Microsoft teams					
2nd Year	15 (8.2%)	32 (17.4%)	110 (59.8%)	27 (14.7%)	184 (100%)
3rd Year	17 (9.6%)	29 (16.3%)	115 (64.6%)	17 (9.6%)	178 (100%)
4th Year	17 (9.4%)	31 (17.1%)	87 (48.1%)	46 (25.4%)	181 (100%)
5th Year	11 (5.8%)	30 (15.9%)	96 (50.8%)	52 (27.5%)	189 (100%)
6th Year (Final Year)	17 (5.9%)	54 (18.7%)	157 (54.3%)	61 (21.1%)	289 (100%)
Total	77 (7.5%)	176 (17.2%)	565 (55.3%)	203 (19.9%)	1021 (100%)
Chi-Square, P-value			30.830, 0.002		
Webex					
2nd Year	14 (7.6%)	33 (17.9%)	125 (67.9%)	12 (6.5%)	184 (100%)
3rd Year	15 (8.4%)	27 (15.2%)	123 (69.1%)	13 (7.3%)	178 (100%)
4th Year	18 (9.9%)	32 (17.7%)	111 (61.3%)	20 (11.0%)	181 (100%)
5th Year	12 (6.3%)	32 (16.9%)	133 (70.4%)	12 (6.3%)	189 (100%)
6th Year (Final Year)	21 (7.3%)	52 (18.0%)	199 (68.9%)	17 (5.9%)	289 (100%)
Total	80 (7.8%)	176 (17.2%)	691 (67.7%)	74 (7.2%)	1021 (100%)
Chi-Square, P-value			8.486, 0.746		
Moodle					
2nd Year	11 (6.0%)	35 (19.0%)	114 (62.0%)	24 (13.0%)	184 (100%)
3rd Year	12 (6.7%)	34 (19.1%)	121 (68.0%)	11 (6.2%)	178 (100%)
4th Year	21 (11.6%)	29 (16.0%)	105 (58.0%)	26 (14.4%)	181 (100%)
5th Year	10 (5.3%)	38 (20.1%)	133 (70.4%)	8 (4.2%)	189 (100%)
6th Year (Final Year)	37 (12.8%)	53 (18.3%)	164 (56.7%)	35 (12.1%)	289 (100%)
Total	91 (8.9%)	189 (18.5%)	637 (62.4%)	104 (10.2%)	1021 (100%)
Chi-Square, P-value			32.672, <0.001		
Email					
2nd Year	12 (6.5%)	46 (25.0%)	43 (23.4%)	83 (45.1%)	184 (100%)
3rd Year	15 (8.4%)	46 (25.8%)	50 (28.1%)	67 (37.6%)	178 (100%)
4th Year	23 (12.7%)	41 (22.7%)	71 (39.2%)	46 (25.4%)	181 (100%)
5th Year	15 (7.9%)	40 (21.2%)	68 (36.0%)	66 (34.9%)	189 (100%)
6th Year (Final Year)	22 (7.6%)	57 (19.7%)	112 (38.8%)	98 (33.9%)	289 (100%)
Total	87 (8.5%)	230 (22.5%)	344 (33.7%)	360 (35.3%)	1021 (100%)
Chi-Square, P-value			29.571, 0.003		

* Statistically significant if *P* value 0.05

Table V: Usefulness of different approaches in facilitating learning experience and success.

	Ranks					
	First	Second	Third	Fourth	Fifth	Total
Approach 1: Live-over PowerPoint presentations (Virtual classes)						
2nd Year	73 (39.7%)	51 (27.7%)	35 (19.0%)	18 (9.8%)	7 (3.8%)	184 (100%)
3rd Year	80 (44.9%)	46 (25.8%)	30 (16.9%)	10 (5.6%)	12 (6.7%)	178 (100%)
4th Year	79 (43.6%)	51 (28.2%)	27 (14.9%)	13 (7.2%)	11 (6.1%)	181 (100%)
5th Year	91 (48.1%)	33 (17.5%)	30 (15.9%)	21 (11.1%)	14 (7.4%)	189 (100%)
6th Year (Final Year)	120 (41.5%)	79 (27.3%)	50 (17.3%)	19 (6.6%)	21 (7.3%)	289 (100%)
Total	443 (43.4%)	260 (25.5%)	172 (16.8%)	81 (7.9%)	65 (6.4%)	1021 (100%)
Chi-Square, P-value			16.869, 0.394			
Approach 2: Recorded-over PowerPoint presentations (Offline/ Recorded classes)						
2nd Year	60 (32.6%)	57 (31.0%)	38 (20.7%)	10 (5.4%)	19 (10.3%)	184 (100%)
3rd Year	66 (37.1%)	52 (29.2%)	27 (15.2%)	22 (12.4%)	11 (6.2%)	178 (100%)
4th Year	65 (35.9%)	54 (29.8%)	35 (19.3%)	17 (9.4%)	10 (5.5%)	181 (100%)
5th Year	52 (27.5%)	52 (27.5%)	40 (21.2%)	23 (12.2%)	22 (11.6%)	189 (100%)
6th Year (Final Year)	77 (26.6%)	81 (28.0%)	67 (23.2%)	31 (10.7%)	33 (11.4%)	289 (100%)
Total	320 (31.3%)	296 (29.0%)	207 (20.3%)	103 (10.1%)	95 (9.3%)	1021 (100%)
Chi-Square, P-value			23.506, 0.101			
Approach 3: Live session to receive a presentation by the teacher (Seminars)						
2nd Year	56 (30.4%)	56 (30.4%)	45 (24.5%)	18 (9.8%)	9 (4.9%)	184 (100%)
3rd Year	55 (30.9%)	36 (20.2%)	52 (29.2%)	26 (14.6%)	9 (5.1%)	178 (100%)
4th Year	50 (27.6%)	48 (26.5%)	58 (32.0%)	18 (9.9%)	7 (3.9%)	181 (100%)
5th Year	48 (25.4%)	53 (28.0%)	55 (29.1%)	23 (12.2%)	10 (5.3%)	189 (100%)
6th Year (Final Year)	93 (32.2%)	70 (24.2%)	74 (25.6%)	31 (10.7%)	21 (7.3%)	289 (100%)
Total	302 (29.6%)	263 (25.8%)	284 (27.8%)	116 (11.4%)	56 (5.5%)	1021 (100%)
Chi-Square, P-value			14.495, 0.562			
Approach 4: Self-study using text and/or video materials provided by the teacher						
2nd Year	63 (34.2%)	45 (24.5%)	40 (21.7%)	23 (12.5%)	13 (7.1%)	184 (100%)
3rd Year	51 (28.7%)	29 (16.3%)	35 (19.7%)	46 (25.8%)	17 (9.6%)	178 (100%)
4th Year	40 (22.1%)	44 (24.3%)	40 (22.1%)	35 (19.3%)	22 (12.2%)	181 (100%)
5th Year	37 (19.6%)	46 (24.3%)	44 (23.3%)	41 (21.7%)	21 (11.1%)	189 (100%)
6th Year (Final Year)	71 (24.6%)	67 (23.2%)	66 (22.8%)	51 (17.6%)	34 (11.8%)	289 (100%)
Total	262 (25.7%)	231 (22.6%)	225 (22.0%)	196 (19.2%)	107 (10.5%)	1021 (100%)
Chi-Square, P-value			26.849, 0.043			
Approach 5: Assignments and homework						
2nd Year	37 (20.1%)	33 (17.9%)	32 (17.4%)	30 (16.3%)	52 (28.3%)	184 (100%)
3rd Year	23 (12.9%)	26 (14.6%)	33 (18.5%)	26 (14.6%)	70 (39.3%)	178 (100%)
4th Year	27 (14.9%)	37 (20.4%)	34 (18.8%)	33 (18.2%)	50 (27.6%)	181 (100%)
5th Year	14 (7.4%)	39 (20.6%)	29 (15.3%)	33 (17.5%)	74 (39.2%)	189 (100%)
6th Year (Final Year)	36 (12.5%)	46 (15.9%)	59 (20.4%)	53 (18.3%)	95 (32.9%)	289 (100%)
Total	137 (13.4%)	181 (17.7%)	187 (18.3%)	175 (17.1%)	341 (33.4%)	1021 (100%)
Chi-Square, P-value			24.804, 0.073			

* Statistically significant if *p*- value <0.05

Table VI: Comparison of agreement scores between students of the different academic year.

Domain	Academic Year	N	Mean	Std. Dev	F-Value	P-value
Students opinion regarding online classes (Average of 9 variables)	2nd Year	184	3.56	0.48	1.764	0.134
	3rd Year	178	3.43	0.56		
	4th Year	181	3.44	0.56		
	5th Year	189	3.49	0.56		
	6th Year (Final Year)	289	3.44	0.59		
	Total	1021	3.47	0.56		
Students opinion on live sessions, tools, materials, technical difficulties, etc. (Average of 8 variables)	2nd Year	184	3.27	0.48	1.655	0.158
	3rd Year	178	3.30	0.51		
	4th Year	181	3.29	0.53		
	5th Year	189	3.39	0.50		
	6th Year (Final Year)	289	3.33	0.48		
	Total	1021	3.32	0.50		
Students opinion comfortability with online classes and distress caused due to COVID 19 (Average of 7 variables)	2nd Year	184	3.26	0.50	4.169	0.002
	3rd Year	178	3.31	0.51		
	4th Year	181	3.13	0.51		
	5th Year	189	3.18	0.46		
	6th Year (Final Year)	289	3.16	0.48		
	Total	1021	3.20	0.49		

* Statistically significant if *P* <0.05

Discussion

Information technology has gained importance furthermore in the academic arena considering the ongoing pandemic, which has led to the closure of all educational institutions worldwide and thus gave rise to multiple challenges at all levels and stages in education, especially for students[5]. The cross-sectional online survey explored and assessed the impact of the COVID-19 global pandemic crisis on changing educational patterns among 1021 medical

students of various universities in Saudi Arabia. Many participants in the study reported that they were happy with the teacher's transition from offline classes to online classes during Covid-19 circumstances. Several universities worldwide support e-learning as a means of teaching, and it is highly accepted by the learners[6]. Many studies exist on comparing e-learning with face-to-face teaching. In one of the papers presented at a conference on mobile learning in Singapore, it was stated that the e-teaching technique limits the interaction between student and teacher[7]. This finding was in line with our research, where 52 percent of students thought e-teaching had limited contact between student and teacher. With many e-learning benefits, there are still some drawbacks of such as social isolation, lack of student-teacher interaction and communication issues, etc[8].

Analysis of the survey data allows us to state that 64% of students agree that distance teaching tools used by the teachers were easy to understand and use, considering the use of e-learning in the educational process is uniquely effective. As one of the studies suggests, students have a positive attitude towards e-learning, as they find the system easy to use and useful for their course work. And they get several benefits from e-learning; it allows them to organize the learning process in a better way and to use modern teaching tools effectively[9]. Many other studies also indicate numerous reasons for its overall acceptability are its ease of use, flexibility, and better control of the environment, especially applicable in the case of learners[8-10].

Further, findings showed that 55% of respondents reported that they were very much satisfied with e-learning provided by their institute, and 69% of students reported that their institutes provide them online support and orientation regarding the Covid-19 pandemic crisis. The institutional support for the implementation of e-learning has been reported to be important at all levels by the participants. According to some studies, top-down implementation from administrative to user level is an important and more sustainable strategic move[11,12].

Important to note that the analysis of the study reported 40% of medical students agreed that they experienced some sort of psychological distress during the online learning and the Covid-19 situation, and 60% were distracted by social media, and 45% were distracted by the Covid-19 crisis news. These findings suggest a significant impact of Covid-19 crises on student's mental wellbeing, which could be addressed by universities by taking appropriate measures such as organizing online meditation workshops for students.

Furthermore, computer and internet access are the primary learning/teaching instruments for online learners[13]. To test for e-learning readiness along with exposure to technology, the students were asked the related questions. The majority of the students had functioning internet services at their homes which help them for distance learning. It is argued in some studies that the attitude towards e-learning of 'students' can be evaluated in the following dimensions: study habits, skills, motivation, and their time management behaviour[13,14]. It was found that in the present study only 2.4% students stayed motivated for more than 4 hours and followed sessions and 30% said 'it depends upon the teacher,' about 35% of the students said 'they are not able to concentrate at home while studying.' Thus, measuring students' attitudes has an important role in analysing their behaviour. The study findings also reported significant differences of opinions among students of different academic years on the usefulness of different e-learning methods ranging from Blackboard to learn, Zoom, Microsoft teams, WebEx, Moodle, and emails. The majority of 6th-year medical students found Zoom technology a more apt e-learning tool. In one of the studies conducted among physicians actively engaged in ophthalmology-related education, it was noted that during the pandemic, there was a shift to distance learning, with Zoom being the preferred synchronous Tele-education platform, supporting a large number of participants and providing the opportunity to exchange material. The availability of e-learning facilities and institutional academic character were identified as correlated with Tele-education use[15].

The lower level of e-learning readiness using different approaches reported in this study among medical students of Saudi Arabia is contrary to the proposition Rogers 2003, that increase educational status has a positive influence on e-learning readiness. Findings of the study showed self-study using text and/or video materials provided by the teacher as a significant learning method in comparison to virtual classes, recorded sessions, seminars and assignments, and homework. Other studies have similar results to this research, and the reason for this may be that at higher levels of medical school study, students may be more preoccupied with passing exams using the method they are familiar with, which complements the conventional approaches used to the classroom[16]. Nevertheless, medical students showed significant differences as observed with comfortability with online classes and distress caused due to COVID-19. It shows medical students were able to cooperate and are ready to step beyond a predominant reliance on classroom instruction to the e-learning strategy. It is an increasingly common observation in medical education[17,18]. All in all, the findings of this study can be improved as a part of a detailed strategy for most medical schools in the coming years to increase the scope and quality of their e-learning programs[19].

COVID-19 is an infectious disease with high economic and social burden[20-23]. Findings from the current study suggest some important factors to consider when planning

the implementation of e-learning at medical universities in times of severe emergencies such as Covid-19. Factors including economic, gender and cultural issues need to be further explored, particularly when assessing organizational capacity to address changing educational demands[24,25]. Limitations of the validity of the present study that must be highlighted include finding that not all of the medical schools listed had received responses. Furthermore, the option to leave some questions blank meant that the number of answers obtained variated. In addition, the students' geographical and academic backgrounds were considered inhomogeneous, and this may have influenced their understanding and perceptions as a confounding variable in answering the questions. The questions used in the will provide only a brief representation of the different scenarios in individual disciplines at various universities. Finally, the discussion on the implementation of technology in education spotlights largely on students' perspectives rather than on teachers' views.

Conclusion

In a nation such as the Kingdom of Saudi Arabia (KSA), where education is one of the administration's highest priorities, there is a burning need to investigate the expertise of the students on online education. It is extremely necessary to analyze the views of the students and their perspectives on virtual courses, which will be helpful in producing a more enjoyable and productive education. The findings showed acceptable results showing that respective medical universities of Saudi Arabia provided good online support and orientation regarding the COVID 19 crisis, and students were finding distance learning tools easy to use and understand. At the same time, this study showed no significant association of student's opinions on tools, materials, live sessions, degree of program competency, as well as the perceived value of using different e-learning methods in medical education.

Thus, it is concluded that despite gaining immense popularity today, digital technology has not yet been embraced for use in teaching by medical students. Future steps would be taken based on the findings from the study, and further improvement would be implemented to make the learning process easier for medical students. Furthermore, administrative and staff leaders should take the appropriate steps to increase the standards and acceptance level of e-teaching to further improve student learning during the lockdown.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Credit statement

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