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The attitudes of Syrian Private University Medical Students towards E-Learning during the COVID-19 pandemic: a cross-sectional study

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Abstract

Background The COVID-19 pandemic has had a significant impact on the education sector, leading to the closure of colleges and schools and disrupting the learning process for an uncertain duration. In response, electronic learning has emerged as a suitable method for continuing the educational process during the lockdown. This study aimed to assess the attitudes, practices, and barriers to e-learning among medical students at Syrian Private University.

Methods A cross-sectional survey study was conducted at the Faculty of Medicine of the Syrian Private University (SPU) in Damascus, Syria. The study used a convenience sampling approach and was carried out from June 2021 to January 2022. Data were collected using a self-administered questionnaire structured into two sections. The first section included 12 sociodemographic questions. The second section assessed students' attitudes, practices, and barriers related to e-learning, and consisted of 14 questions on attitudes, 11 questions on practices, and 9 questions on barriers.

Results Of the 519 participating students, over half (55.1%) exhibited a negative attitude towards e-learning. However, more than 60% reported engaging in e-learning activities such as downloading educational content and participating in virtual study groups. The main barriers identified were unstable internet connections (92.7%) and challenges in communication with educators (82.7%). Bionomical logistic regression revealed that negative attitudes were predicted by housing status, academic year, health status, lack of engagement with colleagues in e-learning practices, and the reported barriers of difficulty adjusting learning style, lack of technical skills, poor communication with educators, limited access to devices, and limited space conducive for studying ($P < 0.05$).

Conclusion While medical students at SPU were actively engaged in e-learning, over half held negative attitudes. These negative attitudes were associated with the various barriers that students reported. The findings can inform stakeholders in our institution and other Syrian universities about the challenges of implementing e-learning in medical colleges.

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Introduction

According to the World Health Organization (WHO), the coronavirus disease (COVID-19) has resulted in over 775 million cases and 6.9 million deaths since its emergence in 2019 [1]. This pandemic, caused by the SARS-CoV-2 virus, has had a profound and wide-ranging impact on global civilization, affecting major sectors like the economy, health, education, and social aspects [2]. The burden of this pandemic was far higher on low-income countries due to limited resources and inadequate health care [3]. In Syria, the pandemic significantly impacted a country that already struggles with a decade of ongoing conflict, affecting all vital sectors, particularly the healthcare system [4].

The global lockdowns were intended as a preventive measure to halt the rapid spread of the virus, though their overall effectiveness was mixed. These unplanned strategies created numerous problems, including a decline in social activities, disruptions to the global economy, challenges to food security, and widespread impacts on education [5]. The lockdown had paused the educational process in all its forms for an undetermined period. University students and researchers have experienced a significant decline in academic progress and have encountered various difficulties during this period. The Syrian community has been severely affected by the lockdown, as it has exacerbated their unmet economic and healthcare needs [6]. In the aspect of higher education, in March 2020, the Higher Education Council (HEC) in Syria implemented a lockdown of all higher education institutions for a duration exceeding two months to prevent the spread of the virus. This decision resulted in disruption to the academic year and had a widespread impact on the teaching and learning process [7].

E-learning has emerged as a concept that facilitates comprehensive learning through technological tools. Nowadays, e-learning plays an essential role in university education and further education. It is also utilized for informal training, providing personalized and socially enhanced learning experiences through the Internet [8]. E-learning in medical education has been well implemented even in its clinical spectrum where technical methods were developed to provide appropriate clinical knowledge such as open online courses, virtual reality environments, virtual patients, and psychomotor skills trainers [9]. E-learning, as a medical teaching method, presents a viable alternative to traditional in-person teaching and can assist in resolving the scarcity of medical doctors and educators, especially during a crisis [10–12].

During the abrupt lockdown, e-learning was quickly recognized as an effective method to reengage students in the educational process. However, due to the emergent situation, the implementation of this approach was accelerated without proper planning. This led to various unmet needs and challenges in e-learning. It can be acknowledged that the adoption of e-learning in educational facilities was compelled by the pandemic [13]. The transition to an alternative mode of learning, coupled with the challenges posed by the pandemic and the lockdown, resulted in significant difficulties for both educators and students.

Time constraints, technical skill deficiencies, inadequate infrastructure, a lack of institutional strategies and support, and negative attitudes are some of the main barriers to the development and adoption of e-learning in medical education [14]. These limitations pose a substantial burden, especially for low-income countries. In Syria, The HEC encouraged educational facilities to use alternative teaching methods such as online learning. However, numerous higher education institutions, particularly large public universities, were ill-equipped to implement the HEC's online education mandate. Insufficient training among teaching staff in these new educational methods was notable. Moreover, students faced insurmountable obstacles such as the absence of necessary equipment, limited internet access, and inadequate support for online programs. Consequently, the Ministry of Higher Education ultimately rescinded the online education mandate, instructing institutions to return to face-to-face teaching after the lockdown and make up for the missed courses [7].

Recent research papers worldwide have extensively focused on assessing the attitudes, practices, and barriers to e-learning among medical students [13]. This is thought to be crucial as the success of this teaching method depends on several factors. The acceptance and accessibility of this approach from the students and teachers are considered the most significant, especially in the context of medical education where accurate healthcare education is vital for proper healthcare services. Notably, during the pandemic, the medical college at the Syrian Private University (SPU) implemented online distance learning for the first time to adapt to the lockdown. However, the impact of this new teaching strategy on students was not previously evaluated. Therefore, this current study aims to assess medical students' attitudes toward e-learning, evaluate their practices and barriers related to this teaching method, and explore potential predictors of negative attitudes among the participating students.

Methods

Study design, participants, and sample size calculation

From June 2021 to January 2022, a cross-sectional study was conducted at the Faculty of Medicine of the Syrian Private University (SPU) in Damascus, Syria. The study aimed to investigate the use of e-learning tools among medical faculty students from the 1st to the 6th year. Specifically, during the study period, teachers incorporated various e-learning tools, including recorded lectures and online discussions, into their courses. The inclusion criteria for the study were current enrollment at the Syrian Private University and previous exposure to e-learning methods among medical students. It is important to note that some students may have been compelled to withdraw from classes due to the impact of the pandemic. Prior to participation, students were informed that their involvement was voluntary, and all their responses would be recorded anonymously. Additionally, students were informed that their involvement was voluntary, all responses would be recorded anonymously, and they were free to withdraw from the study at any time. The sample size was calculated by using the following single-population proportion formula: $n = [(Z\alpha/2)^2 * P * (1—P)] / d^2$ where $Z\alpha/2 = 1.96$ at the 95% level of significance, P = Proportion to be estimated = 50%, and d = degree of precision (0.05). The estimated required sample size was 385 students.

Study tool

We used a self-administered Arabic-language questionnaire that was modeled from several published studies [15–17]. The first section of the questionnaire contained nine questions about socio-demographic and background information including gender, age, social status, residence, academic year, housing, financial difficulties during the pandemic, level of electricity (e.g., poor, moderate, low quality), and internet connection quality (e.g., High, Good, Acceptable, low). In addition to the same section, 3 added questions about COVID-19, (1) self-reported health assessment, (2) whether they have sufficient knowledge regarding COVID-19, and (3) their source of information regarding COVID-19. The second section consists of 34 questions divided into three parts: attitudes to e-learning (14 of 5-point Likert scale questions), practice evaluation of e-learning (11 of Yes/No questions), and barriers to e-learning (9 of 4-point Likert scale questions).

Questionnaire reliability

The questionnaire was initially prepared in English and then translated into Arabic, the local language, for wider accessibility. To ensure consistency in meaning and concepts, the translated questionnaire was then translated back into English. This translation process was carried out by two healthcare teachers who were responsible for both the translation and review of the final questionnaire. The Research Ethics Committee approved the questionnaire before its implementation. To assess the questionnaire's clarity, reliability, relevance, and acceptability, a pilot study was conducted. A total of 35 students were invited to participate in the pilot study and provide feedback on the questionnaire. Out of these invitations, 30 students accepted and shared their perceptions. However, it should be noted that this pilot study sample was excluded from the final sample to prevent any potential bias. During the pilot study, any questions that were found to be unclear or that did not adequately cover the study's concept were modified accordingly, based on the feedback received from the participating students. Cronbach's alpha test was applied to determine the internal consistency of the questionnaire. The Cronbach's alpha value of the whole Arabic questionnaire was 0.714. The items were considered to represent an acceptable level of internal consistency [18].

Data collection

The questionnaire was distributed using two methods to ensure a diverse sample and minimize bias. The first method involved using online platforms such as WhatsApp and Telegram, where the questionnaire was shared through a Google Form survey. This approach allowed for chain-referral sampling, where respondents were encouraged to forward the questionnaire to their friends and colleagues. The second method was carried out by a dedicated data collection group under the supervision of the principal investigator. This group was responsible for distributing the questionnaires to students during the intervals between classes. To ensure convenience sampling, the data collection group enlisted the help of external individuals who were asked to voluntarily distribute the questionnaires. These external individuals were provided with comprehensive information about the study's objectives and methodology, as well as detailed instructions on how to effectively carry out the distribution process.

Statistical analysis

The data collected through face-to-face administration of the questionnaires was integrated into the online questionnaire in Google Forms by the investigators. This integration process involved manually entering the responses from the face-to-face interviews into the corresponding sections of the original online questionnaire. By merging the data obtained from both sources, a unified dataset was created for analysis. We used Statistical Package for Social Sciences version 26.0 (SPSS Inc., Chicago, IL, United States). Frequencies and percentages for categorical and mean with SD for continuous variables. Attitudes were scored as; strongly agree- 1, Agree- 2, Neutral- 3,

Disagree- 4, and strongly Disagree- 5, for reversed items (2 items), scores were reversed and computed as strongly agree- 5, Agree- 5, Neutral- 3, Disagree- 2, and strongly Disagree- 1, in dependence of the score means outcome, two levels were adopted, namely; Negative attitude (<39), and Positive attitude (39<). Statistical analysis employed chi-square tests to examine negative and positive attitudes. The analysis assessed: (1) demographics and participants' characteristics, (2) students' practice evaluation of medical e-learning, (3) and the reported barriers to e-learning. Binomial logistic regression was conducted to identify predictors of a negative attitude (<39). The Enter method was used to analyze three categories of independent variables with the dependent variable. The Nagelkerke R Square was employed as an indicator of the model's goodness of fit. *P*-values<0.05 were considered statistically significant.

Ethical consideration

The Research Ethics Committee approved the study protocol by the Syrian private university (SPU), faculty of medicine at date (1/5/2021). Informed consent was obtained from every participant before participation. This study did not include participants younger than 18 years old. This study was performed in accordance with the Declaration of Helsinki.

Results

Socio-demographic characteristics

A total of 519 out of 583 (response rate=89.02%) undergraduate medical students completed the survey. Of them, more than half were females (50.5%). The study participants had a mean age of 21±2.01 years. Approximately 40% of the participants reported experiencing financial difficulties during the pandemic, while 41.8% indicated poor electricity connectivity. Furthermore, over two-thirds of the participants stated that they possessed sufficient knowledge about COVID-19. Social networking pages and groups served as the primary sources of information about COVID-19 for more than 50% of the participants. (Table 1).

Attitudes of participants toward E-learning

Among the 519 students included in the study, more than half of the sample (55.1%) exhibited negative attitudes towards e-learning. Over half of the participants (53.9%) strongly agreed that old devices and poor internet quality hindered their use of e-learning. Just over three-fifths of the participants reported a lack of interaction between students in e-learning. A significant proportion of participants (67.2%) agreed that there was poor communication between lecturers and students in the e-learning environment. The majority of students (69.6%) expressed a preference for direct communication and interaction with lecturers rather than electronic communication. More than half of the sample (52.4%) stated that e-learning is often not preferred due to its potential to increase social isolation. (Table 2).

Practices and barriers of E-learning

Table 3 presents a summary of the participants' responses concerning the evaluation of e-learning practices and the barriers associated with it. More than half of the respondents reported engaging in various activities related to e-learning: accessing online courses for medical information (15.4%), downloading educational content (64.2%), sharing materials with peers (59.5%), participating in virtual study groups (54.5%), utilizing personal computers for online studying (57.2%), incorporating the internet into their regular academic routines (61.1%), and opting for electronic content over paper formats to save costs (46.6%).

The majority of the participants identified several barriers to e-learning, as shown in Table 3. These included difficulties in adapting to the learning style (87.7%), challenges in maintaining effective communication with educators (82.7%), and unstable internet connections (92.7%). Additionally, over half of the respondents cited specific obstacles such as a lack of technical skills (55.1%), limited access to devices or the internet (55.3%), and limited space to study (68.8%).

Predicted factors of negative attitude towards E-learning

Three binomial logistic regression models were run on three categories of independent variables (Table 4). The initial model examines socio-demographic factors as predictors of the outcome variables, this model was statistically significant, $X^2=46.9$, $P<0.001$. Of the variation in medical students' negative attitudes toward e-learning (<39), this model predicted 11.6% (Nagelkerke R Square). Of the four predictor variables, three were statistically significant ($P<0.05$). 2nd and 3rd-year students had two times higher odds of negative attitude compared to those in other academic year categories. Students who live alone demonstrated a twofold higher likelihood of having negative attitudes compared to those living with their families.

The second model examines practices as predicted factors of the negative attitudes, this model was statistically significant, $X^2=42.3$, $P<0.001$. Of the variation in medical students' negative attitudes toward E-learning (<39), this model predicted 10.5% (Nagelkerke R Square). Of the eight predictor variables, only one was statically significant ($P<0.05$). students who did not share educational materials with their colleagues have 1.7 times higher odds of having negative attitudes compared to those who did.

The last model examines barriers as predictors of the outcome variables, this model was statistically significant,

Table 1 Socio-demographics and participants' characteristics ($N=519$): n (%)

Sex	Male	257 (49.5)
	Female	262 (50.5)
Age	18–20	155 (29.9)
	21–24	329 (63.4)
	25<	35 (6.7)
Residence	City	400 (77.1)
	Countryside	119 (22.9)
Housing	Living with family	378 (72.8)
	Living alone	95 (18.3)
	Living with friends	46 (8.9)
Social Status	Single	455 (87.7)
	In relationship	57 (11)
	Married	7 (1.3)
Academic year	1st	57 (11)
	2nd	69 (13.3)
	3th	68 (13.1)
	4th	107 (20.6)
	5th	151 (29.1)
	6th	67 (12.9)
financial difficulties	Yes	195 (37.6)
	No	324 (62.4)
Rated electricity connectivity	Poor	217 (41.8)
	Moderate	173 (33.3)
	Good	122 (23.5)
	Excellent	7 (1.3)
Rated internet connectivity	Low quality	94 (18.1)
	Acceptable quality	151 (29.1)
	Good quality	166 (32)
	Very good quality	84 (16.2)
	High quality	24 (4.6)
health status	Poor	24 (4.6)
	Moderate	73 (14.1)
	Good	196 (37.8)
	Very Good	151 (29.1)
	Excellent	75 (14.5)
Do you have sufficient knowledge about the emerging corona epidemic?	Yes	367 (70.7)
	Not enough	120 (23.1)
	No	32 (6.2)
Your source of information about the emerging coronavirus	Social networking pages and groups	273 (52.6)
	Official websites such as WHO, CDC, and UpToDate	210 (40.5)
	Global and local media	193 (37.2)
	Official local information issued by government agencies	182 (35.1)
	Friends, neighbors, and relatives	86 (16.6)

$X^2=27.5$, $P<0.001$. Of the variation in medical students' negative attitudes toward E-learning (<39), this model predicted 6.9% (Nagelkerke R Square). Students who stated difficulty adjusting learning style, lack of technical skills, poor communication with educators, no device or limited access, and limited space conducive for studying as barriers have 1-1.8 times higher odds of having negative attitudes compared to those who did not.

Discussion

The COVID-19 pandemic abruptly disrupted the educational process, necessitating the rapid adoption of alternative teaching methods, such as e-learning. Many educational institutions found themselves implementing this approach for the first time. E-learning emerged as a convenient means for reintegrating students into the educational process. It can be argued that the pandemic expedited the implementation of e-learning methods without prior planning. Numerous universities in

Table 2 Attitude of study participants to e-learning (*N* = 519)

Items	SA (%)	A (%)	N (%)	D (%)	SD (%)
E-learning is hard to afford	31 (6)	115 (22.2)	244 (47)	105 (20)	24 (4)
It is difficult to understand electronic lectures without the guidance of the lecturer	78 (15)	177 (34.1)	104 (20)	120 (23.1)	40 (7.7)
Old devices and poor internet quality affect me in using e-learning	280 (53.9)	158 (30.4)	49 (9.4)	27 (5.2)	5 (1)
It's hard for me to use a home computer	55 (10.6)	67 (12.9)	110 (21.2)	198 (38.2)	89 (17.1)
There is no interaction between students in E-learning	125 (24.1)	200 (39.5)	103 (19.8)	72 (13.9)	19 (3.7)
There is no direct communication with the lecturer in E-Learning	125 (24.1)	200 (38.5)	103 (19.8)	72 (13.9)	19 (3.7)
Communication between the lecturer and the student is poor in e-learning	121 (23.3)	228 (43.9)	92 (17.7)	62 (11.9)	16 (3.1)
It is difficult to gain enough information in e-learning	88 (17)	130 (25)	106 (20.4)	136 (26.2)	59 (11.4)
E-learning requires a lot of mental effort	43 (8.3)	187 (36)	142 (27.4)	122 (23.5)	25 (4.8)
Electronic communication with the lecturer is inconvenient when completing projects	62 (11.9)	204 (39.3)	158 (30.4)	76 (14.6)	19 (3.7)
I prefer direct communication and interaction with the lecturer more than electronic communication	163 (31.4)	198 (38.2)	79 (15.2)	59 (11.4)	20 (3.9)
E-learning is often not preferred because it increases social isolation	91 (17.5)	181 (34.9)	118 (22.7)	98 (18.9)	31 (6)
It is easier to read printed lectures than electronic lectures	166 (32)	154 (29.7)	90 (17.3)	74 (14.3)	35 (6.7)
Downloadable E-learning content is better than Live content	117 (22.5)	146 (28.1)	161 (31)	77 (14.8)	18 (3.5)

SA: Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree

advanced nations adopted e-learning to respond to the epidemic [19]. However, in low-income countries like Syria, switching to e-learning necessitates several adaptations to ensure effective delivery. A technological framework had to be constructed, and educators had to rapidly modify their curriculum. Following the lockdown in Syria, SPU's response was swift; within a month, a platform featuring audio presentations and WhatsApp groups alongside teachers was built to increase students' connection with teachers. This study aimed to assess attuited, practices, and barriers towards e-learning among medical students at Syrian Private University. In addition, this study aimed to identify predicted factors of negative attitudes towards the experience of e-learning.

Syrian Private University was one of the few Syrian institutions that implemented e-learning during the pandemic, and this study is the first in Syria to evaluate this experience. The study found that while over half of the respondents were actively engaged in e-learning activities, 55.1% of the surveyed medical students exhibited negative attitudes toward e-learning. Negative attitudes were predicted by several factors, including housing status, academic year, health status, lack of engagement with colleagues in e-learning practices, and the reported barriers of difficulty adjusting learning style, lack of technical skills, poor communication with educators, limited access to devices, and limited space conducive for studying.

While numerous studies in the Middle East have investigated e-learning, offering valuable insights, the findings of this study contrast with some previous research. A previous study in Libya indicated that the medical students exhibited relatively positive attitudes, but over half also showed inadequate e-learning practices [16]. In contrast, a study at King Saud University found most medical students had a positive attitude towards online classes, though 59.6% reported difficulties obtaining explanatory information - a challenge faced by 42% of the sample in this study [20].

A Lebanese study revealed that approximately 39% of the participants reported low satisfaction with this mode of learning [21], while studies in the UAE and Iran reported generally acceptable attitudes toward e-learning [22, 23]. These variations in results may be influenced by the different contexts in which the studies were conducted, as each country has its unique educational system, and infrastructure, which can impact students' perceptions of e-learning [24]. It is crucial to acknowledge that the current study was conducted in Syria, a country that has experienced severe conflict and crisis, significantly impacting the necessary infrastructure for e-learning. Additionally, the psychological burden faced by Syrian students is an external factor that may have influenced their acceptance and engagement with online education [25]. Although this influence was partially evident in our findings, it is important to note that the study did not directly assess the psychological impact on students through specific measures.

The present study found students living alone were more likely to develop negative attitudes toward e-learning, and over half the participants agreed it contributes to increased social isolation. These results are consistent with findings from other studies. For example, according to a King Saud University study, two-thirds of participants believed that distance learning impeded their ability to meet and collaborate with friends [20], while a Lebanese study revealed that students who preferred online education over in-person education exhibited

Table 3 Practices and barriers of e-learning ($N=519$)

NO.	Item		Totals *n* (%)
P1	Were you awarded certificates through online training courses related to the medical field?	Yes	80 (15.4)
		No	439 (84.6)
P2	Did you participate in any online medical education program during this period (such as the ZOOM app)?	Yes	143 (27.6)
		No	376 (72.4)
P3	Did you use the internet to attend courses to obtain medical information or understand medical concepts?	Yes	347 (66.9)
		No	172 (33.1)
P4	Do you download content periodically related to your medical education?	Yes	296 (57)
		No	223 (43)
P5	Did you use online applications and platforms for medical education purposes?	Yes	224 (43.2)
		No	295 (56.8)
P6	Do you share educational material with your fellow medical students at your faculty?	Yes	309 (59.5)
		No	210 (40.5)
P7	Did you use the internet to study with a friend or a group of friends through online meetings?	Yes	283 (54.5)
		No	236 (45.5)
P8	Do you utilize your personal computer for online studying?	Yes	297 (57.2)
		No	222 (42.8)
P9	Do you use the internet regularly in your studies?	Yes	317 (61.1)
		No	202 (38.9)
P10	Have you downloaded electronic content instead of purchasing paper form of study materials to save money?	Yes	333 (64.2)
		No	186 (35.8)
P11	Did you purchase an electronic device to have access to E-learning opportunities?	Yes	242 (46.6)
		No	277 (53.4)
B1	Difficulty adjusting learning style	Always	28 (5.4)
		Often	177 (34.1)
		sometimes	250 (48.2)
		Never	64 (12.3)
B2	Lack of technical skills	Always	25 (4.8)
		Often	99 (19.1)
		sometimes	162 (31.2)
		Never	233 (44.9)
B3	Mental Health difficulties	Always	30 (5.8)
		Often	73 (14.1)
		sometimes	152 (29.3)
		Never	264 (50.9)
B4	Poor communication with educators	Always	61 (11.8)
		Often	164 (31.6)
		sometimes	204 (39.3)
		Never	90 (17.3)
B5	unstable internet connection	Always	187 (36)
		Often	168 (32.4)
		sometimes	126 (24.3)
		Never	38 (7.3)
B6	No device or limited access	Always	34 (6.6)
		Often	106 (20.4)
		sometimes	147 (28.3)
		Never	232 (44.7)
B7	Limited space conducive for studying	Always	46 (8.9)
		Often	131 (25.2)
		sometimes	180 (34.7)
		Never	162 (31.2)

Table 3 (continued)

NO.	Item		Totals *n* (%)
B8	Need to fulfill responsibilities at home	Always	47 (9.1)
		Often	63 (12.1)
		sometimes	112 (21.6)
		Never	297 (57.2)
B9	Need to work for extra income	Always	27 (5.2)
		Often	43 (8.3)
		sometimes	93 (17.9)
		Never	356 (68.6)

P: practices items, B: Barriers items

significantly lower scores in social functioning [21]. Additional research stratified that e-learning led to prolonged social isolation and restricted interaction with peers [26]. However, it is important to note that this study was conducted during the COVID-19 pandemic, a period characterized by lockdowns and limited social activities [27]. Therefore, it may not be entirely accurate to conclude that e-learning is the primary cause of social isolation. Future studies should consider assessing this issue under normal circumstances, outside of emergencies.

Preclinical students in their second and third years demonstrated a higher propensity for negative attitudes towards e-learning. This aligns with a King Saud University study [20], but it contrasts with findings from Iran [23]. Previous research states that preclinical students tend to hold negative attitudes toward online teaching as they believe it restricts their communication, teamwork, brainstorming, critical thinking, ability to orient themselves, and access to support [28]. Recent research recommended that hybrid learning, combining online and in-person methods, is generally considered more effective than online-only approaches [29].

This study identified several key barriers impacting attitudes towards e-learning. Notably, poor communication with educators emerged as a significant issue, as approximately 80% of the sample reported this problem. Additionally, in the King Saud University study, more than half of the participants stated this limitation [20]. Relatedly, In the Sudan study, 24% of students expressed concern regarding the interaction with peers and instructors during online sessions [30]. Qualitative research further indicates issues related to poor communication with educators encompass various aspects, such as ineffective educational feedback, which includes one-sided communication or a lack of two-way communication, deficiency in student-educator interaction, and limited interaction between student and health profession educators across different platforms [31].

Another significant barrier was a lack of technical skills and limited access to devices, reported by over half of the sample. Prior research supports this, with studies of medical students in Egypt finding that 23% reported a lack of internet connection, and 5% reported a lack of devices as barriers to online e-learning [32]. Similarly, a Sudan study revealed that 40% of the sample expressed concerns regarding technical support and only 38% stated good internet quality [30]. In contrast, studies in Libya [16] and King Saud University [20] reported generally good availability of technical resources.

The variations in e-learning barriers across regions can be attributed to a combination of factors. One key factor is the level of technological infrastructure and connectivity in each area. Developed regions are more likely to have reliable and advanced technological infrastructure resulting in fewer barriers related to internet access and quality. Conversely, regions with limited infrastructure or remote areas may face challenges in accessing stable internet connections, leading to higher reported barriers [33]. Students' access to technological resources and technical support can affect their overall satisfaction with e-learning. Notably, the study findings highlight the significant effect of various barriers on e-learning practices in the context of war-torn Syria. The severe infrastructure challenges caused by the conflict have directly affected the accessibility and reliability of e-learning resources and platforms. Consequently, has hindered students' ability to fully engage and participate in online education. For instance, the lack of technical skills is considered one of the most significant barriers to e-learning, resulting in a negative impact on the acceptance of this teaching method [34]. This issue is particularly pronounced in the context of Syria, as confirmed by the study findings. The final decision to withdraw online education by the Ministry of Higher Education in Syria reflects the impact of barriers on e-learning practice.

This study identifies significant predictors for negative attitudes toward e-learning. Pinpointing these predictors is crucial as modifying those factors leads to better outcomes when using this educational approach. it is recommended to focus on improving accessibility, user experience, and comprehensive training while fostering a positive learning environment. Implementing

Table 4 Binominal Logistic Regression For Predicting Negative Attitudes Towards e-Learning

Model	Variables	Categories	Odds ratio	95% CI (lower-upper)	*P*-value
A	Housing status	Living with friends	1.669	(0.863 - 3.225)	0.128
		Living alone	2.177	(1.316 - 3.602)	**0.002***
		Living with family	Reference		
	Academic year	1st	1.17	(0.564–2.452)	0.665
		2nd	2.28	(1.110–4.722)	**0.025***
		3th	2.37	(1.148–4.911)	**0.020***
		4th	1.15	(0.612–2.168)	0.661
		5th	0.92	(0.509–1.693)	0.806
		6th	Reference		
	financial difficulties	Yes	1.334	(0.910–1.955)	0.140
		No	Reference		
	health status	Poor	2.953	(1.044–8.352)	**0.041***
		Moderate	2.419	(1.193–1.904)	**0.014***
		Good	1.937	(1.098–3.415)	**0.022***
		Very Good	1.737	(0.967–3.121)	0.06
		Excellent	Reference		
B	P3	No	1.462	(0.950–2.250)	0.084
		Yes	Reference		
	P4	No	1.230	(0.816–1.854)	0.322
		Yes	Reference		
	P5	No	1.203	(0.824–1.765)	0.338
		Yes	Reference		
	P6	No	1.738	(1.163–2.596)	**0.007***
		Yes	Reference		
	P8	No	1.061	(0.699–1.610)	0.782
		Yes	Reference		
	P9	No	1.408	(0.932–2.128)	0.104
		Yes			
	P10	No	1.368	(0.920–2.034)	0.121
		Yes	Reference		
	P11	No	1.026	(0.691–1.522)	0.900
		Yes	Reference		
C	B1	Always, often, sometimes	0.954	(0.522–1.740)	0.877
		Never	Reference		
	B2	Always, often, sometimes	1.668	(1.125–2.472)	**0.011***
		Never	Reference		
	B4	Always, often, sometimes	1.550	(1.043–2.304)	**0.030***
		Never	Reference		
	B6	Always, often, sometimes	1.063	(0.701–1.614)	0.773
		Never	Reference		
	B7	Always, often, sometimes	1.802	(1.102–2.948)	**0.019***
		Never	Reference		

A: socio-demographic factors, B: practices as predicted factors, C: barriers as predicted factors.

*$P < 0.05$

these recommendations is anticipated to enhance medical students' engagement with and positive perception of e-learning.

Limitation

A key limitation of this study is its reliance on self-reported data, particularly for variables such as social status, internet connectivity, and electricity connectivity. Participants' tendency to provide socially desirable responses may have impacted the study outcomes. One limitation is the lack of clarity in certain survey questions, such as those related to health status and knowledge about the emerging coronavirus pandemic, rated internet and electricity without specifying assessment criteria. Additionally, the predominantly young age group (21–24 years) in the sample might not fully represent the wider

student population, and the subgroup analysis based on residence may limit generalizability. Moreover, this study was conducted on university student regardless of their nationality which may affect the generalizability of the study results. Furthermore, the study's external validity is constrained by its focus on a single private university in Syria, which does not represent the entire educational population. Finally, the use of Google Forms as the data-gathering tool may have introduced potential bias.

Conclusion

While the majority of respondents reported engaging in e-learning activities, more than half of participating medical students showed negative attitudes toward e-learning. These negative attitudes were driven by the barriers to e-learning that were reported.

The findings of this study have important implications for stakeholders within the institution, as well as other universities in Syria, regarding the challenges associated with the adoption of e-learning as an effective teaching approach in medical colleges. it is recommended to raise knowledge and influence attitudes towards e-learning adoption within medical colleges, the university should organize awareness webinars discussing the challenges and benefits of e-learning, featuring expert speakers and interactive sessions. Additionally, specialized training courses should be offered to faculty members, equipping them with knowledge about the benefits of e-learning and practical guidance on its implementation.

Abbreviations

WHO	World Health Organization
HEC	Higher Education Council
E-learning	Electronic learning
COVID-19	coronavirus disease of 2019
SPSS	The Statistical Package for Social Sciences
SPU	Syrian Private University

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12909-024-05817-0.

Supplementary Material 1

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Author contributions

Mhd Homam Safiah, Mhd Obai Alchallah, Homam Alolabi, Muhammad Omar ElHomsi, and Sham Ataya conceptualized the study, participated in the design, and wrote the study protocol. Mhd Homam Safiah and Khaled Kalalib Al Ashabi performed the statistical analysis and were responsible for the literature search. Muhammad Omar ElHomsi was responsible for the literature search and drafted the manuscript. Fatema Mohsen revised the final draft. Louie Darjazini Nahas supervised the study and revised the draft. All authors read and approved the final draft.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Research Ethics Committee in a Syrian private university. Informed consent was obtained from every participant before participation. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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