



Original article

The influence of COVID-19 related psychological and demographic variables on the effectiveness of e-learning among health care students in the southern region of Saudi Arabia



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ABSTRACT

Background: E-learning is a modern and flexible mode of education and is being used as an alternative to conventional mode of education during the ongoing COVID-19 pandemic. However evidence suggests that effectiveness of e-learning is influenced by many prevailing factors.

Methods: A cross sectional study aimed to evaluate health care students' perception towards implementation of e-learning was conducted for a period of 4 months, from April 2020 to July 2020. Research instrument consisted of a self-designed, qualitative questionnaire with three domains was validated using field pretest method and administered among health care students of King Khalid University using social media platforms. Chi square test was used to estimate the effect of e-learning on various domains whereas linear regression analysis was used to find the association between subjects' characteristics to overall domain scores. P value < 0.05 was considered significant.

Results: Among 254 respondents 59.8% were males and 96.5% respondents were staying with their families. 10.2% reported medically imposed quarantine for one or more family members. 59.8% reported that the online classes were commenced too early. 63.4% of the respondents reported that they had no previous experience. Poor network connectivity (32.3%) and unawareness about online platforms (29.9%), poor audio/video qualities (26.3%) were found as major barriers. Psychological stress, discipline of study, living status and quarantine history had a remarkable impact on the effectiveness of online education.

Conclusion: Health care students are still cynical and are yet to embrace e-learning fully. Psychological distress, technical issues in association with accessibility, inexperience and unpreparedness were found to be main barriers that limited student acceptance of e-learning.

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1. Introduction

The outbreak of the COVID-19 resulted in the closure of conventional academic activities and opened the doors for e-learning as an alternate method around the world (UNESCO, 2020). However, moving from an environment of conventional to e-learning does

not happen overnight (Bao, 2020). E-learning coupled with the ongoing pandemic offers a great challenge to academic institutions and students to keep teaching and learning relevant and effective (Daniel, 2012; Almaghaslah et al, 2018).

In view of the ongoing pandemic many impediments towards e-learning approach has been postulated. E-learning is considered as a modern and flexible mode of education (Pei and Wu, 2019). However, recent evidence suggests that the effectiveness of e-learning is influenced by many additional factors during the pandemic (Umek et al., 2015). Access to e-learning, sudden swap from traditional to online teaching, social and psychological wellbeing including student and pandemic specific demographic characteristics have been found to have a major influence on the effectiveness of online teaching and learning process (Rajab et al, 2020). Furthermore, remote teaching is more dependent on students' ability to

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self-learn. As a result it poses a major difficulty in learning complex scientific concepts and practice domains through virtual comprehension and visualization. As e-learning facilitates and directs self-learning, it may be difficult to maintain self-discipline among students without any physical supervision. Moreover, lack of supportive home environment and family issues further attenuate their concentrating and learning ability (Cook et al, 2008; Bartley and Golek 2004). As far as higher education is concerned, the ongoing pandemic created a magnanimous impact on students' practices towards academic work and life due to shifting to online lectures, closure of libraries, transformed communication means for teachers and administrative support, newer assessment methods, different workloads, performance levels, etc. (Aristovnik et al, 2020a; Abelskamp and Santamarinam, 2020; Owusu-Fordjour et al, 2020; Khan, 2020)

Therefore, it is important to find out students' attitudes and perspectives towards online teaching and the impact of different variables that influence the online teaching and learning process. There is an absolute paucity of published literature about pandemic specific factors that influence teaching and learning behavior among health care students in Saudi Arabia. To fill this knowledge gap, a prospective cross sectional study was undertaken to assess the perception of students towards online teaching and learning and to evaluate pandemic specific psychosocial and demographic factors associated therewith.

2. Methodology

A cross-sectional study aimed to evaluate healthcare students' perception towards the imposition of online learning at King Khalid University, Saudi Arabia. The study was conducted for a period of 4 months from April 2020 to July 2020. The Total strength of health care students at King Khalid University is approximately 3000. Raosoft software was used for calculating the sample size. [Raosoft. Sample Size Calculator. 2004] Keeping the margin of error at 5%, confidence interval at 95%, response distribution 25%, and population size of 3000, the required sample size was calculated as 263.

Research instruments consisted of a self-designed qualitative questionnaire. Elements of the questionnaire were chosen based on the researcher's academic experience and available literature (Abbasi et al., 2020, George et al 2014, Alsuraihi et al, 2016). A 29-item online questionnaire with three domains was designed, developed, and validated using the field pretest method. The pilot study data was analyzed and internal consistency was calculated (Cronbach's alpha). The estimated Cronbach's alpha coefficient was found to be 0.83. Based on evidence on multiple variables different aspects of students' perception which impacts the students learning were included for the analysis by using a Likert scale, which is as follows.

- COVID-19 affects my social and psychological wellbeing – 3 items (minimum score 3 and maximum 15)
- E-learning improved student-skills –3 items (minimum score 3 and maximum score 15)
- E-learning has more limitations –3 items (minimum score 3 and maximum score 15)
- E-learning is the future of education –2 items (minimum score 2 and maximum score 10)
- E-learning is effective and helpful –2 items (minimum score 2 and maximum score 10)

The survey was developed using online google forms and circulated to the focus group using social media platforms like Facebook, Twitter, WhatsApp, etc. The statistical analysis was done

by using Statistical package for social sciences (SPSS), version 22.0. Data from the survey was downloaded in Microsoft excel format and exported to the SPSS for analysis. Raw scores of each participant for individual domains were converted into transitional score ranges from 0 to 100. The transitional scores with the range of 0–40, 41–60, and 61–100 were categorized into “No”, “Not sure” and “Yes” response groups respectively. Chi-square test was used to estimate the effect of demographic characteristics on various aspects of students' perception of E-learning. Linear regression analysis was used to find the association between students' characteristics to overall scores. P-value < 0.05 was considered significant.

3. Results

283 responded to the survey, out of which only 254 responses were complete and fulfilled the criteria to be included in the study. Among the 254 respondents majority, 152 (59.8%) were males. The age of the students was ranging from 18 to 25. Nearly half of the respondents (49.2%) were belonging to pharmacy followed by medicine (37.4%), nursing (10.6) and others (2.8%). To our surprise, more than half of the respondents (63.4%) reported that they had no previous experience in e-learning. At the time of this study, 245 (96.5%) of the respondents were staying with their families and 10.2% of the respondents reported that one or more of their households were or had a history of medically imposed quarantine (Table 1).

In terms of online teaching and learning experiences, the majority of the respondents (59.8) reported that the decision made by the institution to start online classes was too early. Poor network connectivity (32.3%) and unawareness about online platforms like blackboard collaborate, zoom (29.9%) were found as major barriers and distractions faced by the respondents. However financial issues like decreased income and increased expenditure were found to have little impact on online learning. (Table 2) During the COVID 19, the social and financial aspects of the respondents were least affected. Only 19.7% of the participants reported an increase in expenditure and about a quarter of the participants

Table 1
Demographic and other characteristics of respondents (n = 254).

	Frequency	Percentage %
Gender		
Male	152	59.8
Female	102	40.2
Age		
18–20 years	51	20.1
21–25 years	203	79.9
Program of study		
Medicine	95	37.4
Pharmacy	125	49.2
Nursing	27	10.6
Others	7	2.8
Level of study		
Undergraduate	252	99.2
Masters	2	0.8
Previous experience in E-learning		
Yes	93	36.6
No	161	63.4
Current living status		
Roommates	3	1.2
Family	245	96.5
Alone	6	2.4
History of medically imposed quarantine for family member		
Positive	26	10.2
Negative	228	89.8

Table 2
Technical issues faced by the students due to COVID-19 pandemic.

	Response	Frequency	Percentage %
Has your institution moved to virtual teachings due to COVID-19 crisis?	Yes	247	97.2
	No	7	2.8
If yes, how efficiently was the decision made	Too early	152	59.8
	At a right time	70	27.6
	Too late	32	12.6
During online classes, technical issues you faced?	Poor network connectivity	82	32.3
	Frequent Power cut	54	21.3
	Poor audio/video quality	67	26.3
	Problem with using application	76	29.9
	Disconnection	39	15.3

reported a decrease in financial income and difficulties in accessing essential supplies such as food, groceries, etc.(Table 3)

The effects of demographic characteristics on various aspects of students' perception were shown in Table 4. Gender differences do not seem to have an effect on any of the perceptions of online education. The results show that the frequency of pharmacy students (25%) are less affected socially and psychologically due to COVID 19 and related changes in online education ($p < 0.05$). Pharmacy students are more in favor of online education and a statistically significant difference was found between other discipline students. Compared with other disciplines, pharmacy students are highly believing in the concept that online education is the future of the education ($p < 0.05$). Living status is the major factor which has an impact on multiple students' perceptions including "COVID-19 affects my social and psychological well-being", "E-learning improved student-skills", and "E-learning is effective and helpful" ($p < 0.05$). Around 94.3% of the subjects with a negative family history of quarantine status stated that e-learning was effective and helpful. Social and psychological well-being was significantly affected by family quarantine status. ($P < 0.05$).

Prior experience in e-learning was found to have a significant impact on the various perceptions among students, but at the same time the social and psychological domain has no impact. Nearly 72.2% of students with no prior experience in e-learning reported that e-learning improved the skills but not found to have a significant impact. Meanwhile, lack of experience in e-learning has a great impact on the perception that "e-learning has more limitations" ($p < 0.05$). A majority of the students in the current study

Table 3
General issues faced by the students due to COVID-19 pandemic.

	Response	Frequency	Percentage %
Has your institution closed its student dormitories or residences due to the COVID-19 crisis	Yes	154	60.6
	No	100	39.4
In this COVID-19 crisis, is there any change in the expenditures?	Decreased	145	57.1
	Same as before	59	23.2
	Increased	50	19.7
During COVID-19, have you experienced any of the following difficulties?	Accessing essentials like food, groceries, vegetables, etc.	39	15.3
	Decreased financial income	68	26.8

who had no prior experience in e-learning stated that e-learning has more limitations (78.9%), 77.3% and 82.1% of the students with no prior experience in e-learning reported that e-learning is the future of education and it is effective and helpful respectively.

4. Discussion

During this COVID-19 crisis, academic institutions were at the forefront to face the consequences of these lockdowns. In order to ensure academic delivery to students and assessing their performance, e-learning through different platforms were adopted as an alternate method for teaching and learning (Zhang et al, 2020). Though e-learning was available earlier, it was not practiced widely and extensively, owing to certain limitations at both provider and recipient levels. Limited-time, technical issues, and demographic characteristics of the students have been found to have a major influence on the effectiveness of e-learning. (Boyte-Eckis et al, 2018).

In health care education, one of the sudden and significant transformations due to the pandemic was the cancellation of the conventional face to face classes. As a result e-learning mode evolved as an alternate method of teaching and learning that was adopted and practiced by academic institutions across Saudi Arabia (Alqurshi, 2020). In view of the above presented facts, this study was taken up to assess and evaluate the impact of various demographic and pandemic specific factors on the effectiveness of online education.

Gender, academic discipline, living status, and quarantine history are the major demographic factors that have an impact on the perception of students with respect to online education (Rizvi et al, 2019). Even though the difference is not statistically significant, the overall results of our study show that the males are having a positive attitude and perception towards e-learning than females. Evidence suggests that male students usually use gadgets for programming and problem solving while females tend to use them for word processing alone. Moreover, male students also have more experience with computers outside of school, which builds their self-confidence and positive attitudes about computers (Islam, 2011). Empirical results suggest that the transition from onsite to online lectures due to the Covid-19 crisis had a stronger effect on males, part-time students, undergraduate students, applied sciences students, students with a lower living standard, and students from less developed regions (in Africa and Asia), while the pandemic generally had a greater effect on students who were female, full-time, undergraduate and had financial problems with respect to their emotional life and personal circumstances. (Aristovnik et al, 2020b; Shahzad et al, 2020)

Around half of the respondents were belonging to the discipline of pharmacy followed by medicine and nursing. Among the respondents who belong to various disciplines, the pharmacy students in general were in favor of e-learning. They differed significantly concerning "social and psychological wellbeing" and "e-learning is the future of education". These results are in congruence with a study (Leong et al, 2015) which compared the attitudes of pharmacy, dentistry, and dental hygiene students towards online education and reported that pharmacy students responded more favorably compared with students from other disciplines.

The ongoing pandemic has been found to have a social and psychological impact on individuals who are either staying alone or with their families. Our study revealed that those living with their families and those who were not quarantined were having a positive attitude and perceptions such as "social and psychological well-being", "e-learning improved student-skills" and "e-learning is effective and helpful". Generally, for college students, high levels of psychological stress and negative academic consequences are

Table 4
Effect of demographic characteristics on students' perception towards e-learning: (Chi square test).

Statement	Response	Total	Gender		Living status			Quarantine history	
			Male N (%)	Female N (%)	Alone N (%)	Family N (%)	Friends N (%)	Quarantined N (%)	Not quarantined N (%)
Social and psychological well being	No	111	75 (67.6)	36 (32.4)	6 (5.4)	104 (93.7)*	1 (0.9)	4 (3.6)	107 (96.4)*
	Not sure	115	62 (53.9)	53 (46.1)	0 (0.0)	114 (99.1)*	1 (0.9)	15 (13.0)	100 (87.0)*
	Yes	28	15 (53.6)	13 (46.4)	0 (0.0)	27 (96.4)*	1 (3.6)	7 (25.0)	21 (75.0)*
E-learning improved student-skills	No	26	20 (76.9)	6 (23.1)	0 (0.0)	26 (100.0)*	0 (0.0)	3 (11.5)	23 (88.5)
	Not sure	77	41 (53.2)	36 (46.8)	4 (5.2)	70 (90.9)*	3 (3.9)	11 (14.3)	66 (85.7)
	Yes	151	91 (60.3)	60 (39.7)	2 (1.3)	149 (98.7)*	0 (0.0)	12 (7.9)	139 (92.1)
E-learning has more limitations	No	25	18 (72.0)	7 (28.0)	1 (4.0)	24 (96.0)	0 (0.0)	3 (12.0)	22 (88.0)
	Not sure	87	57 (65.5)	30 (34.5)	2 (2.3)	85 (97.7)	0 (0.0)	10 (11.5)	77 (88.5)
	Yes	142	77 (54.2)	65 (45.8)	3 (2.1)	136 (95.8)	3 (2.1)	13 (9.2)	129 (90.8)
E-learning is the future of education	No	118	67 (56.8)	51 (43.2)	3 (2.5)	115 (97.5)	0 (0.0)	12 (10.2)	106 (89.8)
	Not sure	48	32 (66.7)	16 (33.3)	0 (0.0)	48 (100.0)	0 (0.0)	5 (10.4)	43 (89.6)
	Yes	88	53 (60.2)	35 (39.8)	3 (3.4)	82 (93.2)	3 (3.4)	9 (10.2)	79 (89.8)
E-learning is effective and helpful	No	84	57 (67.9)	27 (32.1)	0 (0.0)	81 (96.4)*	3 (3.6)	7 (8.3)	99 (94.3)*
	Not sure	65	33 (50.8)	32 (49.2)	4 (6.2)	61 (93.8)*	0 (0.0)	13 (20.0)	52 (80.0)*
	Yes	105	62 (59.0)	43 (41.0)	2 (1.9)	103 (98.1)*	0 (0.0)	6 (5.7)	77 (91.7)*

Statement	Response	Total	Prior experience		Discipline of study			
			Yes N (%)	No N (%)	Pharmacy N (%)	Nurses N (%)	Medicine N (%)	Other N (%)
Social and psychological well being	No	111	37 (33.3)	74 (66.7)	71 (64.0)*	16 (14.4)	1 (0.9)	23 (20.7)
	Not sure	115	26 (22.6)	89 (77.4)	47 (40.9)*	10 (8.7)	4 (3.5)	54 (47.0)
	Yes	28	10 (35.7)	18 (64.3)	7 (25.0)*	1 (3.6)	2 (7.1)	18 (64.3)
E-learning improved the skills	No	26	8 (30.8)	18 (69.2)	14 (53.8)	1 (3.8)	1 (3.8)	10 (38.5)
	Not sure	77	23 (29.9)	54 (70.1)	35 (45.5)	12 (15.6)	1 (1.3)	29 (37.7)
	Yes	151	42 (27.8)	109 (72.2)	76 (50.3)	14 (9.3)	5 (3.3)	56 (37.1)
E-learning has more limitations	No	25	14 (56.0)	11 (44.0)*	10 (40.0)	2 (8.0)	2 (8.0)	11 (44.0)
	Not sure	87	29 (33.3)	58 (66.7)*	41 (47.1)	8 (9.2)	2 (2.3)	36 (41.4)
	Yes	142	30 (21.1)	112 (78.9)*	74 (52.1)	17 (12.0)	3 (2.1)	48 (33.8)
E-learning is the future of education	No	118	43 (36.4)	75 (63.6)*	70 (59.3)*	14 (11.9)	5 (4.2)	29 (24.6)
	Not sure	48	10 (20.8)	38 (79.2)*	11 (22.9)*	5 (10.4)	0 (0.0)	32 (66.7)
	Yes	88	20 (22.7)	68 (77.3)*	44 (50.0)*	8 (9.1)	2 (2.3)	34 (38.6)
E-learning is effective and helpful	No	105	32 (30.5)	73 (69.5)*	42 (50.0)	8 (9.5)	1 (1.2)	33 (39.3)
	Not sure	65	26 (40.0)	39 (60.0)*	36 (55.4)	5 (7.7)	1 (1.5)	23 (35.4)
	Yes	84	15 (17.9)	69 (82.1)*	47 (44.8)	14 (13.3)	5 (4.8)	39 (37.1)

*p value < 0.05 considered significant.

widespread during normal circumstances (Grubic et al, 2020). As a result of physical distancing measures implemented in response to the COVID-19 pandemic, the negative consequences like poor mental health and skill development are expected to further exacerbate academic stressors for students (Choi et al, 2020).

Socio-demographic factors also play an important role in the students' perception of different aspects of academic work/life as the current pandemic has had a huge impact on social life (closed dorms and therefore moving back home, no meetings with friends, relatives, no parties, no traveling, remaining trapped abroad, etc.), as well as their personal financial situation (loss of student job, worries about their own financial situation, future education and career) and emotional health (fears, frustrations, anxiety, anger, boredom, etc.) (Van Bavel et al, 2020; Cao et al, 2020; Brooks et al, 2020; Liu et al, 2020; Perz et al, 2020). On top of the many challenges, the pandemic has led to some more positive changes in habits and mindsets, like paying greater attention to personal hygiene, taking care of one's own health (quitting smoking, eating organic food sourced locally) In our study, only a small portion of students reported that COVID-19 had impacted their social and psychological wellbeing which is in line with Cao et al., who reported in their study that only a quarter of the respondents experienced anxiety symptoms, which were positively correlated with increased concerns about academic delays, economic effects of the pandemic, and impacts on daily life due to COVID-19. (Cao et al, 2020). Other similar studies (Röhr et al, 2020; Aylie et al, 2020) had demonstrated that quarantine measures during COVID-19 outbreaks have severe negative consequences on mental health which eventually resulted in decreased academic performance.

Lack of experience in online education is an important factor that impacts the perception towards e-learning. Despite the efforts of ministry of higher education, Saudi Arabia, to build a strong infrastructure for e-learning (Naveed et al, 2017), a majority of the respondents reported that they had no such experience before. Apart from respondents' willingness, poor network connectivity and unawareness about online platforms were found as major barriers. However financial issues like decreased income and increased expenditure were found to have little impact on online learning. In order to understand the limitations and underlying impediments it is important to identify and determine key factors responsible thereof. In view of the existing barriers and challenges Saudi Arabia needs to transform academic culture and work towards bringing changes in terms of facilitating online education by providing the necessary infrastructure and manpower. Some of the studies conducted earlier are in agreement with our findings, stating that E-learning requires previous experience, periodical training, reliable internet connection, and the necessary hardware and software (Schrodt and Turman, 2005).

Several studies have been conducted to compare e-learning with the conventional face to face teaching. Although many studies claim that there is no significant difference between the performance of students taught by e-learning and face to face learning (Adnan and Anwar, 2020; Pei and Wu, 2019), our study found that e-learning is perceived to have little impact on improving the skills. Moreover, Alqurshi A. recently conducted a study on the impact of COVID-19 lockdown on pharmaceutical education in Saudi Arabia and reported that greater than half of the students rated that e-teaching hindered their performance which is in congruence with our study (Alqurshi, 2020).

Difficulty in understanding complex, scientific concepts through online teaching is one of the major impediments in e-learning, particularly for medical education (Sadeghi et al, 2014). Remote teaching is more dependent on students' ability to self-learn. Contrary to the recent findings by Peine et al. which claimed self-directed e-learning can outperform traditional face-to-face learning (Peine et al, 2016), a majority of our respondents reported that self-learning requires the student to maintain self-discipline, which can be difficult without direct supervision from the teacher. A significant proportion of the participants considered online teaching as the future of education. E-learning offers flexibility since anytime and anywhere it can easily be accessed. Ease of access to educational materials and the ability to choose the time and place to study were shown as the strongest advantages of online learning (Verawardina et al, 2020). Remote access is of particular importance during the COVID-19 pandemic (Stain et al, 2005). It widens accessibility to learning opportunities and brings improved motivation and engagement through the new things to be learned. Of course, these new experiences will not be the same as previous ones, but it has been facilitating students' learning process (Fairén et al, 2020).

5. Limitations of the study

The study was conducted during COVID-19 pandemic as a result there were some obvious hurdles and limitations that could not be avoided. At the outset the study was conducted for a limited period of time. The sample population could not be widened due to the ongoing hostile circumstances and access to potential respondents. Only subjective outcomes limited to reflect students' perception and satisfaction with online learning were studied and measured. Therefore, more research and evidence is required to investigate the effectiveness, acceptances and underlying barriers that affect online learning.

6. Conclusion

The practice of e-learning was in place before the fall of covid-19 pandemic in Saudi Arabia. The results of our study revealed that medical students are still cynical and are yet to embrace e-learning in letter and spirit due to various psychological social and demographical variables. Along with psychological and demographic factors, technical issues in association with accessibility, inexperience and unpreparedness were also found to be main barriers that limited student acceptance of e-learning as an alternative to conventional teachings. These findings call for relevant authorities to collaborate with concerned stakeholders and pay attention towards susceptible student groups while seeking to resolve the negative consequences of the ongoing pandemic. More research need to be conducted in areas with a relative paucity of published literature like threat perception, social and behavioural context, science communication and stress coping.

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Ethical approval

Ethical clearance was obtained from the Research Ethics Committee at King Khalid University (Ref# ECM#2020-1105).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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