Perceptions of pharmacy students towards online learning during COVID-19 pandemic in Saudi Arabia

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ABSTRACT

The Saudi pharmacy colleges have been adopted online learning (*e*-learning) as a part of student education and fully moved to it during the COVID-19 pandemic, except for some practical courses. One of the items that assess the success of online learning is students' perception. This study investigates pharmacy students' perception of online learning during the COVID-19 pandemic in Saudi Arabia and discovers the major barriers to *e*-learning. A cross-sectional online survey was conducted using a questionnaire. The study was carried out among pharmacy students in Saudi Arabia in the period between September 2020 and May 2021. A 5-point Likert scale format was used to assess students' level of satisfaction. A total of 2030 students from different pharmacy colleges in Saudi Arabia completed the survey. Of these students, 87.5% praised the effectiveness of online learning. Approximately, 85% were satisfied and encourage *e*-learning continuation in the future. Barriers facing the students during the *e*-learning were categorized into access and personal barriers. Among access barriers, technical problems were the most common (59%). Whereas discomfort with online education was the most personal barrier (56.2%). The current study showed positive perceptions among pharmacy students in Saudi Arabia towards online learning. During the COVID-19 pandemic, most students were pleased with their experience and encouraged online learning to continue in the future. The most common barriers to online learning were lack of internet access and poor connection as well as the students' discomfort with online education.

Keywords: Online learning, COVID-19, Pharmacy students, E-learning, Perceptions, Barriers

Introduction

Online learning, also known as *e*-learning, has been part of the educational process provided by the majority of the universities around the world to support traditional face-to-face learning many years ago [1-4]. Online learning has been a method of learning between learners and teaching staff not directly face-to-face but concurrently through interactive platforms on the internet in various locations [5]. In China, in December 2019, the Coronavirus disease 2019 (COVID-19) induced by an innovative strain of coronavirus was identified [6-8]. On January 30, 2020, it was announced as an international public health emergency by the World Health Organization (WHO) [6]. COVID-19 was confirmed as a worldwide pandemic on 11 March 2020 [6]. This new virus has affected the world in all respects, including the field of education [9]. Therefore, the online lectures/classes were chosen by schools, colleges, and universities as an alternative way to continue education [9].

There were many advantages of online learning, such as recording lectures and saving on the blackboard, enabling students to return to these lectures at any time [10]. Students could attend their classes at home and they have the opportunity to learn in their own time, and particularly free [10]. On the other hand, there were some disadvantages of online learning, including the fact, that it did not depend on face-to-face interactions that made it difficult to analyze students' feedback [10]. In addition to that, for fields requiring practice, online learning could be difficult and in-person learning was essential [10]. Sharpe and Benfield explored the student experiences of

online learning at Oxford Brookes University in a study in 2005 [11]. They outlined the most popular trends in the online learning experience of the student and suggested impacts such as student experience's sentimentality and concern about time and time management [11]. Fedynich *et al.* in 2015 examined the perceptions of online learning among graduate students at a South Texas university [12]. The result indicates that contact between learners and educators has a big effect on their satisfaction [12]. Some challenges found included adequate support for learners related to campus services and the demand for different educational planning and delivery to promote the willingness of students [12]. On the other hand, students were extremely pleased with the consistency and coherence of instruction using appropriate materials [12]. The role of the teacher was described as crucial to the satisfaction of the students [12]. An American study was conducted by L. A. Hamilton *et al.* in February 2020 [13]. This study aimed to determine pharmacy students' preferences towards the effectiveness of online learning in pharmacy schools in the United States [13]. The results found that a combination of a conventional classroom and online learning methods is favored by US pharmacy students [13]. Also, another study was conducted by L. Y. Muilenburg and Z. L. Berge in January 2005 in the USA [14]. This study aimed to analyze barriers affecting students' online learning [14]. Several barriers and variables were determined and analyzed in this study [14]. The findings showed that the most significant barrier, as viewed by the student's viewpoint, was the lack of social interaction [14]. In agreement with this, an Indonesian research conclusion of the perceptions of electronic learning by students done by Mu'in and Amelia in 2018 indicates positive responses to the evaluation, learning performance, and assessment [15]. All these studies somehow produced constructive responses to online learning.

In March 2020, the COVID-19 began to spread in Saudi Arabia [16, 17]. As a result, the Ministry of Education in Saudi Arabia (MOE) decided to make an emergency shift to distance online learning in all colleges and universities for the rest of the second semester of the 2019- 2020 academic year [16, 17]. Furthermore, MOE decided to continue the *e*-learning for the academic year 2020/2021 [16, 17]. Blackboards have been used for all teaching and interactive sessions, including discussions [18]. Materials for instruction were provided, both synchronously and asynchronously [18].

University education would certainly not be the same after the COVID-19 pandemic passes [19]. Online education has become a new standard [19]. Pharmacy colleges in Saudi Arabia had adopted online learning as a part of student's educational process and completely shifted to it during the COVID-19 pandemic [16-18]. An exception for that, some practical sessions that need face-to-face interaction have been conducted in the college laboratories with all preventive precautions to ensure the safety of students and teaching staff [16-18]. A study has been conducted in Saudi Arabia in September 2020 by M.S. Shawaqfeh *et al.* aimed at obtaining input from pharmacy students to evaluate their behavior, readiness, and obstacles towards distance online learning that was imposed by the COVID-19 pandemic

[20]. This study showed a positive behavior of students toward online learning at King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS) [20]. Students also regarded the institution, educators, and their readiness for online learning positively [20]. Most of the students were satisfied with the online learning experience due to COVID-19 during the university's lockdown [20]. Another study in Saudi Arabia conducted by Majid Ali *et al.* in December 2020, intended to discuss the perceived effect from pharmacy students' viewpoint of the on-campus activities suspension on learning outcomes during the COVID-19 pandemic [21]. Most of the participants suggested that recording lectures and 'live' lecture recordings would enhance their online learning [21]. The students also, recommended that the teaching staff should change their teaching techniques to better clarify the nuanced concepts in online pharmacy education [21].

It would be necessary to take students' impressions and perceptions of the effectiveness and productivity of online learning and the barriers they have been faced to improve the educational process in the future, especially in health fields. Perception is a way of evaluation and interpretation of experiences and individual senses which are strongly influenced by multiple factors relating to everyone [22]. There were limited data about Saudi pharmacy students' perception regarding their online education. The purpose of this study is to investigate pharmacy students' perceptions towards their experience in online learning and barriers faced their learning process during the pandemic of COVID-19.

Materials and Methods

Study design

A cross-sectional survey was conducted online using a self-administered questionnaire. The study was carried out among pharmacy students in Saudi Arabia in the period between September 2020 and May 2021. The questionnaire was distributed online using social media such as Twitter, WhatsApp, and Telegram and was completed anonymously. The questionnaire was available for a full month, from March 23 to April 23, to collect the required samplesize. The study included all pharmacy students in Saudi Arabia who were willing to join in the present study. On the other hand, pharmacy students who refused to participate were excluded.

Sample size

Using Daniel's formula, the sample size was estimated at a confidence interval of 95% and a margin of error of 5% as follows [23].

Daniel's formula

$$ n = \frac{Z^2 P (1 - P)}{d^2} \qquad (1) $$

Where:

n: the sample size

Z: Z table value at 95% confidence level =1.96

P: The population's maximum variability at 50%. P: i.e.(0.5).

d: Sampling error at 5% i.e. (0.05)

$$n = \frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2} = 384.16 \qquad (2)$$

Based upon this calculation, the minimum sample size was estimated to be 384 participants.

Survey questionnaire design

The questionnaire was developed after an extensive search of the literature. Relevant studies were reviewed to develop an appropriate questionnaire for the present study. Three professionals in survey studies have reviewed the questionnaire for the accuracy and clarity of the questions. Thereafter, the questionnaire was reformatted according to their feedback. In addition, a pilot study was conducted among ten pharmacy students to determine their understandability of the questions. The final draft of the questionnaire is composed of twenty-one questions that are divided into three parts as follows: First part contains five questions designed to gather the demographic characteristics of the participants, including gender, current year of the study, and their cumulative grade point average (cGPA) before and during online learning. The second part contains fourteen statements designed to investigate the participants' perceptions towards online learning during the COVID-19 pandemic. The third part contains two questions designed to investigate the barriers that faced participants during online learning.

A five-point Likert scale format was used to obtain the level of satisfaction. Each response has given score as follows: strongly disagree = 1point (0%), disagree = 2 points (25%), neutral = 3 points (50%), agree = 4points (75%), strongly agree = 5points (100%). Whereas, for the third part; participants were allowed to pick multiple answers for each question in this part.

Data analysis

The data were analyzed using SPSS version 24 software. Descriptive analysis such as mean, percentages, and frequency was used to describe the study participants. P-value < 0.5 was chosen as a level of significance. A one-way ANOVA test was used to examine students' satisfaction with the effectiveness of online learning and the number of barriers at different demographic levels. T-test was used to compare the mean difference between genders and change in the cGPA, while ANOVA test was used to compare the mean difference among different levels of study. The mean percentages of the perceptions were determined by adding each participant's responses to all fourteen statements, then dividing the total by 14, and multiplying the result by 100 to get the mean percentage for each participant. The total of all participants' mean percentages in the predetermined categories was then divided by the number of participants in that group to get the mean percentage. The same procedure was done to get the mean number of barriers for each category.

Results and Discussion

A total of 2030 pharmacy students had completed the online questionnaire. Out of 2030 participants, 991 (48.8%) were males and 1039(51.2%) were females. Most of the students (24.4 %) were in their second year of study. One-third (31.7%) of the students had a cGPA between 4 and 4.49 before the online learning. Whereas more than half of them (59.8%) had a cGPA of 4.5-5 during online learning and few students (3.6%) had a cGPA less than 3 out of 5. **(Table 1)** shows the demographic data of the participants.

Table 1. Demographic characteristics of participants			
Question	**Answer**	**Frequency**	**Percentage**
Gender	Male	991	48.8%
	Female	1039	51.2%
Current year of study	First-year	411	20.2%
	Second Year	496	24.4%
	Third Year	455	22.4%
	Fourth-year	404	19.9%
	Fifth year	264	13.0%
Cumulative grade point average (cGPA) prior to online learning	4.5 − 5	619	30.5%
	4 - 4.49	643	31.7%
	3.5 - 3.99	432	21.3%
	3 - 3.49	225	11.1%
	Less than 3	111	5.5%
cGPA during online learning	4.5 - 5	1214	59.8%
	4 - 4.49	195	9.6%

3.5 - 3.99	440	21.7%
3 - 3.49	107	5.3%
Less than 3	74	3.6%
Total	2030	100.0%

In the current study, the pharmacy students in Saudi Arabia were generally positive about their experience with online learning. This was not surprising as the students and teaching staff have been familiar with online education and how to use the Blackboard application. Most of the respondents highly praised the effectiveness of online learning (87.5%). This came in agreement with previous studies conducted in Britain, America, Indonesia, and other two Saudi studies that reported positive responses to the effectiveness of online learning [11, 12, 14, 20, 21]. The positive perception about the effectiveness of online learning could be attributed to students' readiness and technology support from colleges, as well as numerous training programs that were provided to the teaching staff by the universities. In the present study, most students said that they learned better during their online courses (52.8%). However, some of the students had learned better from the traditional classes (51.2%). This could be in line with the Hamilton study, which found that the students preferred to combine traditional, and online education [13]. It was possible that the better learning by online classes was due to their flexibility and availability at any time and anywhere. In contrast, the benefit of traditional learning could be because it allows the students to interact and communicate more, as well as the educational environment within the classroom. According to the present study, female students were more satisfied with the effectiveness of online learning than male students were (a statistically significant difference p = 0.048 was observed). This came in line with the Saudi study conducted by M.S. Shawaqfeh et al. [20] For the two statements listed in the mentioned previous study (i.e., behavior and readiness towards online learning), the female students' scores were more than the male students [20]. This could be attributed to the fact that females were more comfortable studying online at home than males. Students in the first year of study at pharmacy colleges were found to be the least satisfied with the online learning whereas senior students in the fifth year were the most satisfied (statistically significant difference p = 0.04). This was logical in light of the previous study by M.S. Shawaqfeh et al. which showed that second-year students were the least prepared, while fifth-year students obtained the highest scores [20]. The lower satisfaction of the first years was predictable as the students were still in the early stages of their college lives and need more support and guidance in most of their courses to succeed, which is more suitable through face-to-face contact. Moreover, more satisfaction was reported by students whose cGPAs increased or maintained(p < 0.001), which is similar to results obtained by previous studies by Sharpe and Benfield, Fedynich et al., and M.S. Shawaqfeh et al. [11, 12, 20]. According to the present study, the vast majority of students agreed that the requirements for passing each course were clear(83.1%), there was enough time for online lectures(84%), the teaching staff was helpful(82.2%), and that

students could communicate during online courses(81.4%). Similarly, a study conducted at a South Texas university by Fedynich et al. indicates that the students were highly satisfied with the accuracy and coherence of teaching materials, communication during the online learning and teachers' role were crucial to the students' satisfaction [12]. The teaching staff' commitment to clarifying the requirements for passing each course at the start of each academic semester resulted in a clear conception for students. Furthermore, the teaching staff' having equal time as traditional lectures, and they were held in the morning so that the student could concentrate on his other duties for the rest of the day. The teaching staff also gave their official e-mails to the students so that they could communicate easily, and the students were allowed to participate and interact during the classes verbally through the microphone and in written chat messages. On the other hand, online exams and grading distribution failed to satisfy 53% of participants. Contrary to Mu'in and Amelia's study which showed positive responses to learning performance and assessment questions [15]. The difference in the results of the two studies could be due to the differences in how colleges set exams and distribute grades. The dissatisfaction of students in the present study could also, be attributed to the shortage of time allowed to complete all assignments and exams. In the current study,83.8% of participants believed that online learning was comparable to face-to-face learning in terms of the ability to master learning objectives like knowledge and clinical skills.

Moreover, 83.1% of students believed that recording online lectures had a great advantage in improving their learning. Besides, the fact that online learning gave 82.9% of them the ability to be more responsible and independent in their tasks. A study from Saudi Arabia conducted by Majid Ali et al. demonstrated that the value of recorded lectures and "live" lecture recordings in enhancing online learning [21]. However, students in the same study suggested that teachers had to modify their teaching methods to better clarify the aspects of online pharmacy education [21]. The advantage of having online lectures available all the time gave students more flexibility in absorbing the largest amount of information without losing their concentration. The students also felt that they oversaw their studies and their lack of physical contact with teaching staff and other students increased their responsibility and independence to accomplish their duties. The present study also, indicated that all the main points in each course were communicated clearly to 82.4% of students. Also, this was considered as one of the 'facilitators for online learning during shutdown in a Saudi study conducted by Majid Ali et al. [21] Clarification of online course's key points was critical to students' understanding of the material and best utilization of it, which could be one of the reasons for improved students learning. Inconsistent with the Saudi study by

Majid Ali *et al.*, the present study found that online learning enhanced the technological skills of the majority of the students(83%) [21]. Additionally, the Saudi study by M.S. Shawaqfeh *et al.* results showed that most of the students did not require computer skills courses as they already had them [20]. Students had technical skills as a result of the advanced nature of life, and as online learning became the new norm, they have been developed and improved these skills. The majority (84.7%) of pharmacy students in the current study were satisfied and encouraged to continue online learning in the future even

when the COVID-19 pandemic ends. A study by M.S. Shawaqfeh *et al.* confirmed this result as most participants were pleased with their online learning experience [20]. The reason for students' desire to continue distance education might be because of its positive impact on them in all aspects, whether academic or financial. **(Table 2)** shows responses to statements exploring students' perceptions towards online learning. **(Table 3)** shows the association between students' satisfaction with the effectiveness of online learning and demographic characteristics.

Table 2. Participants' perceptions towards online learning

Statements	Strongly Disagree N(%)	Disagree N(%)	Neutral N(%)	Agree N(%)	Strongly Agree N(%)
I feel that online teaching is as effective as face-to-face teaching	39 (1.9%)	183 (9%)	33 (1.6%)	377 (18.6%)	1398 (68.9%)
Compared to traditional classes, I learn better through online learning.	49 (2.4%)	175 (8.6%)	735 (36.2%)	472 (23.3%)	599 (29.5%)
I study more efficiently with distance learning.	35 (1.7%)	1004 (49.5%)	40 (2%)	385 (19%)	566 (27.8%)
The requirements for passing each course, including assignments and exams, were clear during online learning	62 (3.1%)	224 (11%)	57 (2.8%)	653 (32.2%)	1034 (50.9%)
The time and duration of the online lectures were sufficient	60 (3%)	222 (10.9%)	42 (2.1%)	652 (32.1%)	1054 (51.9%)
The faculty member was helpful and enthusiastic to teach during online learning	59 (2.9%)	241 (11.9%)	61 (3%)	647 (31.9%)	1022 (50.3%)
I had the opportunity to communicate and interact with teachers and students smoothly during online learning.	46 (2.3%)	253 (12.4%)	79 (3.9%)	652 (32.1%)	1000 (49.3%)
I am satisfied with the grading distribution and the exams during online learning.	478 (23.5%)	599 (29.5%)	32 (1.6%)	51 (2.5%)	870 (42.9%)
Online learning outcomes were comparable to face-to-face learning in terms of the ability to master learning objectives like knowledge and clinical skills.	55 (2.7%)	227 (11.2%)	47 (2.3%)	647 (31.9%)	1054 (51.9%)
Recording online lecture that allows returning to them any time is an advantage of online learning.	62 (3.1%)	227 (11.2%)	53 (2.6%)	634 (31.2%)	1054 (51.9%)
Online learning trains me to be more responsible and independent with my task.	65 (3.2%)	234 (11.5%)	48 (2.4%)	591 (29.1%)	1092 (53.8%)
All key points in each course were communicated clearly during the online learning	66 (3.3%)	239 (11.8%)	51 (2.5%)	624 (30.7%)	1050 (51.7%)
Online learning improves my technology information skills.	61 (3%)	236 (11.6%)	49 (2.4%)	606 (29.9%)	1078 (53.1%)
I am satisfied with online learning and encourage it to continue being part of the educational process even after the end of the COVID-19 pandemic.	95 (4.7%)	150 (7.4%)	65 (3.2%)	418 (20.6%)	1302 (64.1%)

Table 3. Association between students' satisfaction with the effectiveness of online learning and demographic characteristics

Question	Answer	% of students' satisfaction about the effectiveness of online learning (mean±SEM)	Test-Value*	P-Value**
Gender	Male	(75.3%±0.5%)	3.916	0.048
	Female	(76.6%±0.4%)		
Current year of study	First year	(77%±0.6%)	3.809	0.004
	Second Year	(76.8%±0.6%)		
	Third Year	(76.6%±0.7%)		
	Fourth-year	(75.1%±0.8%)		
	Fifth-year	(73.1%±1.2%)		
Change in cGPA	Positive	(76.7%±0.3%)	40.530	<0.001

Negative	(69.9%±1.5%)

On the other hand, the students highlighted several barriers to e-learning **(Table 4)**. Technical issues such as poor internet access and connection as well as the lack of suitable devices for online learning were the most prevalent among access barriers (59% and 55.5%, respectively). Furthermore, students' discomfort with online education was found to be the most common personal barrier to online learning (56.2%). This was followed by frequent interruptions at home (52.7%) and less interest in online learning (52.6%). Students' discomfort might be due to the circumstances of the COVID-19 pandemic, online education had been mandatory although it was still a new experience that requires time to adjust to. This might also, explain why despite they were not fully comfortable yet with online learning, students would welcome its continuity in the future to adopt it. In contrast, a USA study by L. Y. Muilenburg and Z. L. Berge found that the lack of social interaction has been identified by the participants as the most significant barrier [14]. This brings up the question of why the barriers in the two studies differ. The main reason could be the huge time difference between the two types of research. Furthermore, the different geographical areas and the individual variations might be significant factors in the identification of various barriers. Based on the current study, males faced more barriers than females whether they were accessed (p = 0.01, significant difference) or personal-related barriers (p = 0.646, no significant difference) **(Tables 5 and 6)**. These findings were close to those of L.Y. Muilenburg and Z. L. Berge's study [14]. On the other hand, in a Saudi study by Shawaqfeh *et al.* females indicated that they faced more barriers [20]. The cause could be personal differences that might be arisen by chance by the participation of more skilled females in the present study. The present study also revealed that most barriers were reported from the second-year students with a statically significant difference (p = 0.006 for access barriers) and (p = 0.004 for personal barriers). This came in line with the Saudi study by Shawaqfeh *et al.*, which found that students of early years were the most likely to face barriers to online education [20]. The reason might be the same as why students in these early years of study had the lowest satisfaction towards online learning. It was interesting that students who faced the most barriers were also the ones who got the best results of online learning which was indicated by the increase in their cGPA as seen in our study results (P-value <0.001 for both access and personal barriers). This could be a positive point because it demonstrated that no matter what difficulties the student faced, he was able to overcome them and turn them into a source of positive change. These findings were confirmed by an Oxford Brookes University study that emphasized the impacts of online learning on students [11]. The students' attention in overcoming the challenges faced them, as well as their recourse to college support and teaching staff counseling, all contributed to overcoming the barriers of online education. Responses to statements exploring the students' perceptions towards barriers during online learning are shown in **(Table 4)**. **(Table 5)** shows association between the number of online learning access barriers and student demographic characteristics **(Table 6)** shows the association between the number of personal barriers to online learning and students' demographic characteristics.

The present study is not free from limitations. Due to time constrain, the study was conducted only among pharmacy students. It could be possible to conduct the same study among other college students to generate a comprehensive overview of the benefits and barriers to online learning.

Table 4. Barriers facing participants during online learning

Type	Barrier	Frequency	Percentage
Access barriers	Internet service costs too much.	1027	50.6%
	Technical problems such as lack of internet access/poor connection.	1198	59.0%
	Lack of technical support.	983	48.4%
	Lack of access to teaching staff.	998	49.2%
	My device is not suitable for online learning.	1126	55.5%
Personal barriers	Fear of new instruments for online learning.	659	32.5%
	Unfamiliar with tools used for studying online.	615	30.3%
	Lack of technical skills for using delivery system devices.	900	44.3%
	Lack of personal comfort with online learning.	1141	56.2%
	Lack of personal motivation and enjoyment of online learning.	1068	52.6%
	Lack or poor communication skills for online learning.	948	46.7%
	Significant interruptions at home during the online study.	1069	52.7%
	Total	2030	100.0%

Table 5. Association between the number of online learning access barriers and student demographic characteristics

Question	Answer	Number of Access barriers facing online learning (mean±SEM)	Test-Value*	p-Value**
Gender	Male	(2.69±0.03)	6.599	0.010
	Female	(2.57±0.03)		
Current year of study	First-year	(2.74±0.05)		
	Second Year	(2.66±0.04)		
	Third Year	(2.56±0.05)	3.671	0.006
	Fourth-year	(2.65±0.05)		
	Fifth-year	(2.46±0.07)		
Change in cGPA	Positive	(2.68±0.02)	40.109	<0.001
	Negative	(2.21±0.08)		
	Total	(2.63±0.02)		

Table 6. Association between the number of personal barriers to online learning and student demographic characteristics

Question	Answer	Number of Personal barriers facing online learning (mean±SEM)	Test-Value*	P-Value**
Gender	Male	(3.17±0.05)	0.211	0.646
	Female	(3.14±0.05)		
Current year of study	First-year	(3.35±0.07)		
	Second Year	(3.21±0.07)		
	Third Year	(3.02±0.07)	3.844	0.004
	Fourth-year	(3.16±0.08)		
	Fifth-year	(2.96±0.09)		
Change in cGPA	Positive	(3.24±0.04)	52.326	<0.001
	Negative	(2.47±0.1)		
	Total	(3.15±0.03)		

Conclusion

The current study showed positive perceptions among pharmacy students in Saudi Arabia towards online learning. During the COVID-19 pandemic, most students were pleased with their experience and encouraged online learning to continue in the future. The most common barriers to online learning were lack of internet access and poor connection as well as the students' discomfort with online education.

To improve the educational process in the future, an assessment of student's perceptions of the quality and barriers facing online learning is important. A comprehensive and ongoing review is needed to recognize strategies and pinpoint areas for improvement of online learning methods. It is preferable to offer the survey to a greater number of students in the future and to distribute it to colleges with various specializations. Also, taking teaching staff feedback would greatly help to improve the online learning process.

Ethics statement: This study was approved by the Saudi Arabia Research Ethics Committee (REC).

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