Original Research Article

Perception of undergraduates and postgraduates pertaining online learning during the COVID-19 pandemic: a cross-sectional study amongst Sudanese health professional students

Abstract

Background: The novel coronavirus (COVID-19) pandemic has affected all aspects of life globally and locally in Sudan, including institutional and educational services. In Sudan, education is grounded by the traditional method of learning in a classroom (face-to-face lectures). The sudden outbreak of COVID-19 forced some universities and colleges to conduct online learning. This study aimed to assess the perception of health professional students in Sudan, including undergraduates and postgraduates, regarding the possible outcomes of online learning during the COVID-19 pandemic in 2020.

Methods: A cross-sectional study was conducted among both undergraduate and postgraduate health professional students in Sudan. A convenient sample collection method was utilized, from which data was collected online via a self-administered structured questionnaire composed of nineteen questions which were then validated by a medical education expert. The input was assessed and the data was analyzed using a statistical package for social science (SPSS).

Results: Overall, 133 health professional students responded to the web questionnaire, of which 97 (73%) were undergraduates and 36 (27%) were postgraduates. Amongst the undergraduates, 58 (59.8%) expressed a positive perception while 39 (40.2%) expressed a negative perception. Whereas 24 (66.7%) of postgraduates had a positive perception, 12 (33.3%) of them expressed a negative perception regarding online learning in Sudan.

Conclusion: Postgraduate health professionals were more familiar with online learning and expressed a higher level of perception in comparison to the undergraduates. Furthermore, several students were already exposed to hybrid online learning during the current COVID-19 pandemic. Several obstacles to the implementation of online learning in Sudan were stated by the participating students in this study and appropriately managing them is vital for the successful implementation of this mode of learning.

Keywords: Health Professional Students, COVID-19, Online Learning, Perception.

1. Introduction

As the COVID-19 pandemic spreads worldwide, the need to continue medical education becomes of paramount importance, especially when taking into account the recurrent nature of the disease [1, 2]. This has led to the use of already available technologies and methods of online learning with wider applications and more efficient and practical ways [3, 4]. This was also the case in previous pandemics and catastrophic events where the need for continuing life and education was part of the survival mechanisms of communities impacted by these calamities [5-8].

COVID-19 has dramatically affected the quality of life and education in Sudan to the extent where schools and universities constantly ceased and resumed classes [9-11]. Henceforth, an alternative method of education was suggested and initiated in some colleges and private schools with varying success rates [12. 13]. Furthermore, there are different methods for online medical education in use such as Social Collaboration Platforms with live video communication, Massive Open Online Course (MOOC) Platforms and external repositories of universities (Academic Repositories) [14-16].

The classical educational system in Sudan is based on direct face-to-face learning in a classroom. Additionally, online learning in Sudan has an unfavorable history in terms of efficiency and user experience, with it mostly being dependent on individual and small-scale projects [17-18].

Moreover, there are several technical and social challenges facing online medical education in Sudan such as poor electronic infrastructure and continued civil wars in certain parts of the country. Nonetheless, a considerable part of the literature expressed a positive perception of students regarding online learning despite the previously mentioned challenges. To overcome these challenges, several changes are needed both at a local and national level [19].

According to our knowledge, there are no previously published studies that focused on the perception of Sudanese health professional students (HPS) in regards to online learning during the COVID-19 pandemic. Therefore, our current study will aim to assess this level of perception through an online-based survey in order to support further educational efforts in the country during this pandemic.

2. Methods

Online learning in Sudan:

In addition to the use of live broadcasting through social media networks such as Telegram and Zoom, some institutions developed educational websites for their students.

Study design and sampling technique:

A cross-sectional study conducted amongst undergraduate and postgraduate Sudanese health professional students during the COVID-19 pandemic in 2020. Data was gathered from a conveniently collected sample through an online-based survey.

Study tools:

A medical education expert validated the content of the self-administered online structured questionnaire. A pilot study was performed on five students to determine the validity, relevance, and clarity of the questionnaire. Moreover, the pilot study was carried out a week prior to the beginning of the main study by posting the questionnaire on social media networks that are joint exclusively by Sudanese health professional students. The survey contained an introductory letter to inform the students about the study and a statement explaining the voluntary nature of the study. Questionnaires were completed with ease and submitted successfully by the participants.

The questionnaire consisted of nineteen questions, most of which were closed-ended. It included inquiries about students' demographics (age, gender, college, graduation status (under or postgraduate)) and educational status. The remaining questions were about their experiences with online learning, appropriate methods for online medical learning, variables that affect online information delivery, the major obstacles, the impact of financial, social, and economic status on applied online learning, and the effect of online learning on practical skills acquisition. Both undergraduates and postgraduates received the same questions. The questions involved in the questionnaire are available in table (1).

Data collection:

An introductory letter was posted with the survey's web link on social media (Facebook, WhatsApp, Twitter, and Telegram). The Google form survey was available from July until November 2020.

Data management:

Students' perception was assessed using 12 questions with different points for each response, giving a score range from 0 to 23, Cronbach's Alpha level was 0.546. Kolmogorov-Smirnova test was used to test the normality of the data. Since the Sig. <0.05 the data was found to be not normally distributed.

Since perception score was not normally distributed, the median was used to divide the data into the median and above which represent positive perception and below the median, which represents negative perception.

Data analysis

Data was analyzed using a statistical package for social science (SPSS version 23). Descriptive statistics were used to analyze the responses to the perception scales. In the students' perception questionnaire, two items were recorded, where 1 = agree and 0 = disagree. Categorical variables were described as frequencies and percentages, whereas continuous data is presented as median values depending on normality. Moreover, chi-square and Fisher's Exact Test were applied to test the significant association between the median score of students' perception and their age, gender, college, graduation status (under or postgraduate), and the grade year (level) of studying in college regarding undergraduates. The association was considered statically significant if a p-value is <0.05.

1. Results

A total of 133 health professional students responded to the online questionnaire. Out of the 133, (73%) were undergraduates and (27%) were postgraduates (Figure 1). Among the undergraduates, (59.8%) expressed a positive perception, while (40.2%) expressed a negative perception. Although the majority (66.7%) of postgraduates had a positive perception, (33.3%) of them expressed a negative perception about online learning as shown in table (1).

Table (1): Perception of undergraduates and postgraduates amongst Sudanese HPS.

Perception	*Undergraduates*	*Postgraduates*	*P.value*

	Frequency & (%)	Frequency & (%)	
Negative	39 (40.2)	12 (33.3)	0.469
Positive	58 (59.8)	24 (66.7)	
	97 (100)	36 (100)	
Total	133		

Undergraduates contemplating social media, principally Facebook as a source of Perception, nonetheless postgraduates from educational websites and both have experience with a hybrid of synchronous and asynchronous online learning, whilst undergraduates learn via social media and postgraduates through MOOCs as shown in table(1). (50%) of undergraduates were being joined beforehand to Hybrid, (14.8%) to synchronous, and (13.8%) to asynchronous. In contrast, (70.4%) of postgraduates being enrolled before to hybrid, (14.8%) to Synchronous and (14.8%) to asynchronous online learning.

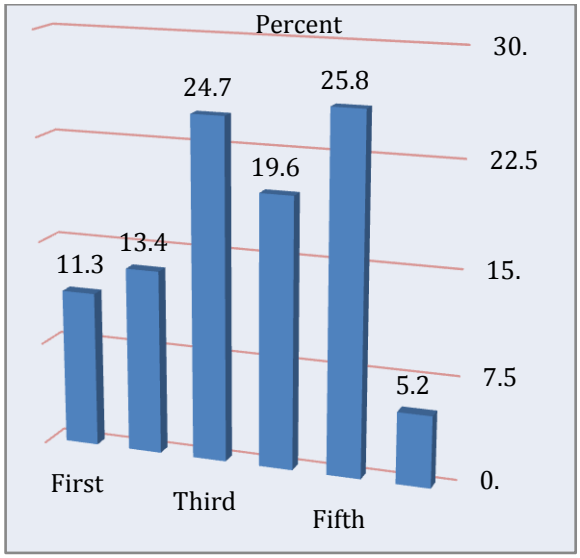
Furthermore, (46.6%) of undergraduates were learning via social media, (17.2%) via Collaboration Platform with live video communication, (29.3%) through MOOC Platforms, and (6.9%) by way of external repositories. On the other hand, (25.9%) of postgraduates were learning through social media, (22.2%) via Collaboration Platform with live video communication, (51.9%) via MOOCs, and (0%) by way of external repositories. (45%) of undergraduates and (36%) of postgraduates stated they have access to financial and social means that facilitated their participation in online learning, whereas (54.6%) of undergraduates and (63.9%) of postgraduates expressed their lack of such resources. (39.2%) of undergraduates and (52.8%) of postgraduates thought that the electronic simulation can, to a certain

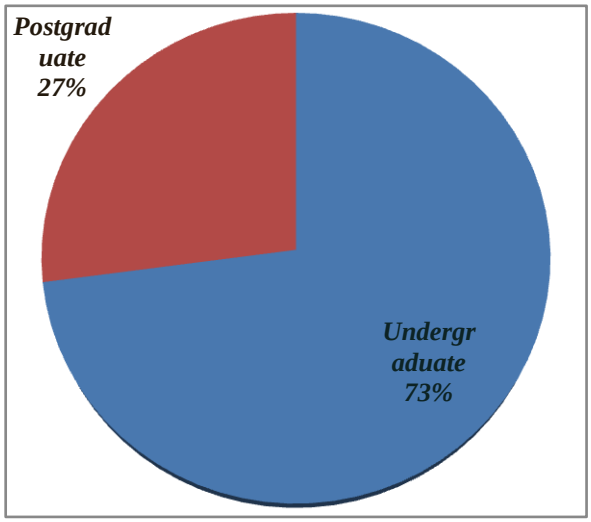
extent, act as a replacement to practical training in the laboratory and hospital, as opposed to (60.8%) of undergraduates and (47.2%) of postgraduates. (15.5%) of undergraduates and (13.9%) of postgraduates believed that there is a better alternative for online learning, however; (84.5 %) of undergraduates and (86.1%) of postgraduates disagree. (36.1%) of undergraduates and (75%) of postgraduates were supporters of online learning continuing even after the pandemic is over, unlike (63.9%) of undergraduates and (25%) of postgraduates. (46.4%) of undergraduates and (58.3%) of postgraduates believed that health professionals can safely practice in a hospital-based setting via online learning whilst (53.6%) of undergraduates and (41.7%) of postgraduates were against that. (37.1%) of undergraduates and (47.2%) of postgraduates thought that there should be a fee for online learning whereas (62.9%) of undergraduates and (52.8%) of postgraduates thought otherwise.

(74.2%) of undergraduates and (83.3%) of postgraduates believe that readily available free online international material could be used in this type of learning in Sudan, however, (25.8%) of undergraduates and (16.7%) of postgraduates do not believe that free online international material in this type or mode of learning is accessible or readily available in Sudan.

The results revealed that there is an insignificant association between perception and group (undergraduate or postgraduate), (P.value:0.469). Furthermore, undergraduate students displayed a significant association between perception and age (P.value:0.06), and an insignificant association with gender, college, and undergraduate level (P.value:0.168&0.478) in order. On the other hand, postgraduate students indicated a significant association between perception and gender (P.value:0.043) and an insignificant association with age and college (P.value:0.205).

Amongst undergraduate students, there was a significant association of age with social media as a source of perception regarding online learning (P.value:0.014), Collaboration Platforms with live video communication as an appropriate method for online learning (P.value:0.004), and student characteristics as a variable that affect the effectiveness of online learning (P.value:0.047).





(A) **(B)**

Figure (1) A: *Distribution of undergraduates According to their academic year.*

B: *Distribution of students according to their graduation status.*

Figure (2): Perception of students regarding online medical education*: In comparison to undergraduates, postgraduate health professional students (HPS) had a higher positive perception (larger box size) regarding online learning; additionally, the perception level of HPS fluctuated according to college.*

1. Discussion

Student perception via online learning is mandatory to assess before its application in Sudan since such type of learning is new and unusual for Sudanese HPS and may therefore be unfamiliar with it. Although there are many factors, obstacles, and challenges affecting the implementation of online learning in Sudan as demonstrated in table (1), there are unfortunately no alternatives to continue student learning safely during the current pandemic.

Students' perception will potentially be a basis to discover HPS comprehension and understanding via online learning in regards to their conditions and current circumstances.

This study indicates that postgraduates have a higher positive perception compared to undergraduates in regards to online learning as illustrated in figure (1). It also represents that more than three-quarters of HPS are familiar with online learning and have heard about it before; undergraduates mainly from social media (particularly Facebook) while postgraduates from educational websites along with prior experience of a hybrid approach between synchronous and asynchronous. This is similar to the study done by Al gahtani *et al*, which showed that there is a growing positive perception of E-learning, but the level of acceptance remains low. The current study is consistent with Elshami et als' study that reported a student satisfaction with online learning may improve by the introduction of hybrid learning. Moreover, it stated that two-thirds of the students were familiar with and have heard of E-learning, but more than two-thirds reported that they did not attend any E-learning courses [20].

According to present findings, half of the undergraduates and almost three quadrants of the postgraduates were supporters of hybrid online learning, this is parallel with Elshamis' study which advocates a hybrid of synchronous and asynchronous online approaches that increase student engagement, notably when incorporating different applications with the learning management systems used to engage students in online learning [21].

In another study, Abbasi *et al*, stated that two-thirds of the students have a negative perception towards E-learning, while Ayob *et als'* study found more than three-quarters of the students have negative perceptions towards E-learning. Both studies are consistent but they are contradictory to the current

study and previous study that was performed by Binshehab *et al* and indicated that both undergraduate and postgraduate students' perception of online learning is positive [21, 22].

Additionally, the present study finds that there is a significant association between perception and age of the undergraduates. This is consistent with the study of Teo *et al.* and Ngamporudna *et al.* which implied that younger students have a greater level of E-learning acceptance [23, 24]. Moreover, the present study discloses a significant association between perception and the gender of postgraduates, and an insignificant association between the perception and age as well as with college. Moreover, there is a variation in the level of perception concerning the college type. As the most eminent perception is, perceive in the college of sciences and Health, that Support present verdicts, which assert the postgraduates of Medical laboratory colleges, have the leading perception amidst other HP postgraduates of colleges, whereas the undergraduates of Medicine are, prove utmost perception amongst undergraduates of other HP colleges as illustrated in figure (1).

The present study conveyed a significant association between the age of undergraduate students and social media as a source of perception about online learning. Furthermore, there was an association between the collaboration platforms with live video communication as an appropriate method for online learning and student characteristics as a variable that affects the effectiveness of online learning. This could explain why another study noticed that most of the students believe that cellular phones could be handled effectively as teaching methods as cell phones facilitate the use of these platforms [25]. The current study revealed that two-thirds preferred considering the possibility of practicing online learning at the moment. More than three-quadrant of the students agreed that the major obstacle against online learning is mainly the network connection, followed by student readiness, interaction, and collaboration.

Conclusively, there was a difference in the level of perception between the undergraduate and postgraduate Sudanese health professional students, as postgraduate students displayed an advanced positive perception towards online learning compared to undergraduates.

3. **Conclusion**

Postgraduate students presented a higher level of perception in comparison to undergraduates. Furthermore, each of them had a previous experience with hybrid online learning during the ongoing COVID-19 pandemic. Moreover, the perception of most students is affected by age and gender, with social media considered the primary source of learning for undergraduates whereas educational websites the preferred method for postgraduates along with Collaboration Platforms with live video communication.

The obstacles that affect the success of online learning for health professional students in Sudan should be taken into consideration. Likewise, there is a need for improvement in the methods employed in online learning amongst health professional students in Sudan.

Consent

Informed consent was taken from each student before partaking in the study. The data was only collected for purpose of the research and no identification questions were used to ensure the privacy of the participants.

Abbreviations

HPS: Health Professional Students.

MOOCs: Massive Open Online Course.

Study Limitations

The questionnaire was posted only in Sudanese social groups and data was collected using the convenience sampling technique, this may impact the generalization of the final results; however, it serve to shine a light on the perception of undergraduate and postgraduate health professional students about online learning in Sudan during the current COVID-19 pandemic.

Availability of data and materials

Data and supplement materials are available under request from the corresponding author.

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Annexes

Table (1)*: Distribution, Association amid perception and demographics of undergraduate and postgraduate Sudanese Health Professional Students.*

Question	***Answer***	***Undergraduates***	***Postgraduates***	***P.value***
Demographics		***Frequency (%)***	***Frequency (%)***	
1/What is your Age?	Less than 20	19(19.6)	0(0)	0.000
	20 to 30	74(76.3)	19(52.8)	
	More than 30	4(4.1)	17(47.2)	
	Total	97(100)	36(100)	
2/What is your Gender?	Male	36(37.1)	11(30.6)	0.482
	Female	61(62.9)	25(69.4)	
	Total	97(100)	36(100)	
3/ Belong any College do you Study?	Medicine	49(50.5)	10(27.8)	0.009
	Pharmacy	17(17.5)	4(11.1)	
	Laboratory	13(13.4)	15(41.7)	

	Nursing	4(4.1)	0(0)	
	Dentistry	8(8.2)	4(11.1)	
	Other Medical related college	6(6.2)	3(8.3)	
	Total	97(100)	36(100)	
4/Are you an undergraduate or post graduate student?	See figure(2)			
Perception				
	Negative Perception	39(40.2)	12(33.3)	0.469
	Positive Perception	58(59.8)	24(66.7)	
	Total	97(100)	36(100)	
Q5/A. Have you heard about online learning before?	Yes	92(94.8)	36(100)	0.201
	No	5(5.2)	0(0)	

	Total	97(100)	36(100)	
5/B.If yes, where did you hear about it the first time?	At university	22(23.9)	5(13.9)	0.134
	From colleagues	11(12)	5(13.9)	
	Social media	34(37)	9(25)	
	Educational websites	25(27.2)	17(47.2)	
	Total	92(100)	36(100)	
Q6/A. What are your thoughts about online learning, is it possible to be applied at present time in Sudan?	Yes	58(59.8)	21(58.3)	0.879
	No	39(40.2)	15(41.7)	
	Total	97(100)	36(100)	
Q7/A. On your opinion, which of the following is an appropriate method for online Medical Learning in Sudan?				
Social Media	Yes	41(42.3)	16(44.4)	0.822
	No	56(57.7)	20(55.6)	

	Total	97(100)	36(100)	
Collaboration Platforms é live video communication	Yes	37(38.1)	16(44.4)	0.51
	No	60(61.9)	20(55.6)	
	Total	97(100)	36(100)	
Massive Open Online Course (MOOC) Platforms	Yes	39(40.2)	16(44.4)	0.659
	No	58(59.8)	20(55.6)	
	Total	97(100)	36(100)	
External repositories of university	Yes	14(14.4)	2(5.6)	0.134
	No	83(85.6)	34(94.4)	
	Total	97(100)	36(100)	
Q8/Do you clam that most of the students have the finical and social ability to participate on Online learning?	Yes	44(45.)	13(36.1)	0.338
	No	53(54.6)	23(63.9)	

	Total	97(100)	36(100)	
Q9/Do you think an electronic simulation could to some extent provide a replacement for practical training in the lab and the hospital?	Yes	38(39.2)	19(52.8)	0.159
	No	59(60.8)	17(47.2)	
	Total	97(100)	36(100)	
Q10/From your perspective, is there a better alternative for online Medical learning?				
	Yes	15(15.5)	5(13.9)	0.821
	No	82(84.5)	31(86.1)	
	Total	97(100)	36(100)	
Q11/What is/are the most essential variable/s that can affect the effectiveness of online delivery?				
Technology	Yes	88(90.7)	35(97.2)	0.19
	No	9(9.3)	1(2.8)	
	Total	97(100)	36(100)	

Instructor characteristics	Yes	77(79.4)	33(91.7)	0.075
	No	20(20.6)	3(8.3)	
	Total	97(100)	36(100)	
Student characteristics	Yes	77(79.4)	32(88.9)	0.155
	No	20(20.6)	4(11.1)	
	Total	97(100)	36(100)	
Q12/Out of the following, which one will be the major obstacle for online Medical learning?				
Network	Yes	78(80.4)	32(88.9)	0.188
	No	19(19.6)	4(11.1)	
	Total	97(100)	36(100)	
Collaboration	Yes	18(18.6)	5(13.9)	0.363
	No	79(81.4)	31(86.1)	
	Total	97(100)	36(100)	
Interaction	Yes	21(21.6)	11(30.6)	0.286
	No	76(78.4)	25(69.4)	

	Total	97(100)	36(100)	
Students Readiness	Yes	22(22.7)	4(11.1)	0.103
	No	75(77.3)	32(88.9)	
	Total	97(100)	36(100)	
Q13/ Do you suppose that online Medical learning should be continued even after the pandemic is over?	Yes	35(36.1)	27(75)	0.000
	No	62(63.9)	9(25)	
	Total	97(100)	36(100)	
Q14/In your Opinion, Health professionals could safely practice in the hospital based on this sort of learning?				
	Yes	45(46.4)	21(58.3)	0.221
	No	52(53.6)	15(41.7)	
	Total	97(100)	36(100)	

Q15/Are you thinking there should be a fee for online learning?				
	Yes	36(37.1)	17(47.2)	0.29
	No	61(62.9)	19(52.8)	
	Total	97(100)	36(100)	
Q16/Do you believe that already available free online international material could be used in this type of learning in Sudan?				
	Yes	72(74.2)	30(83.3)	0.27
	No	25(25.8)	6(16.7)	
	Total	97(100)	36(100)	
17/Do you consider online learning is a fair method despite the different economic status of the learner?				
	Yes	43(44.3)	17(47.2)	0.766
	No	54(55.7)	19(52.8)	
	Total	97(100)	36(100)	
Q18/A.Have you participated in international or local Online Medical learning before?				

	Yes	58(59.8)	27(75)	0.105
	No	39(40.2)	9(25)	
	Total	97(100)	36(100)	
Q19/ How about return to classical real life learning, would it be a better choice during COVID-19 pandemic?				
	Yes	42(43.3)	15(41.7)	0.866
	No	55(56.7)	21(58.3)	
	Total	97(100)	36(100)	