







COVID-19 SPECIAL COLLECTION

RESEARCH ARTICLE

The impact of COVID-19 on pharmacy students in Sudan: A cross-sectional survey

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Abstract

Background: The new coronavirus disease (COVID-19) has impacted many aspects of life. Several studies have investigated the effect of this pandemic on academic activities. Yet, no studies addressed the impact of COVID-19 on students in Sudan. This study examines the impact of COVID-19 on Sudanese undergraduate pharmacy students. **Methods:** A cross-sectional study was conducted using an online questionnaire delivered to undergraduate pharmacy students. **Results:** A total of 137 students responded to the survey. The majority were female (74.5%) and were students in private colleges (60.6%). Majority of the students (95.0%) were affected by COVID-19 crisis and about half of the respondents (54.0%) were depressed and 85.4% reported a decreased level of concentration. In spite of these challenges, majority of our respondents were still motivated (85.3%) to continue their education on campus. **Conclusion:** Despite unprecedented challenges posed by the COVID-19 pandemic, pharmacy students in Sudan are motivated to continue their studies, and they want the traditional teaching model to resume. It is time to invest more in education and rethink delivery of pharmacy education in Sudan during public health emergencies. There is no better time than now.

Introduction

The new infectious disease, COVID-19, was first identified in Wuhan City, Hubei Province of China and was considered a grave threat to mankind. The World Health Organisation was informed of several cases of pneumonia of unknown aetiology (Backer *et al.*, 2020; Riou & Althaus, 2020). On 7th January 2020, Chinese authorities identified the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) as the causative agent (Zhou *et al.*, 2020).

Human-to-human and patient-to- medical staff transmission of the virus have been confirmed (Riou & Althaus, 2020). Following a rapid spread of the outbreak globally (Riou & Althaus, 2020). On 11 March 2020, COVID-19 was declared a pandemic (Jin *et al.*, 2020). The disease can be transmitted through respiratory droplets of an infected individual or touching surfaces contaminated with the virus (Desai & Patel, 2020).

The fight against COVID-19 in Sudan becomes even more challenging since Sudan currently suffers multiple outbreaks such as natural disasters, political and ethnic disputes (Elhadi *et al.*, 2020) all at once. The first novel coronavirus case in Sudan was reported in Khartoum on 13th March 2020. The Government of Sudan declared a national state of a health emergency on 16th March 2020. Many measures were adopted in response to the coronavirus outbreak such as - early diagnosis, contact tracing, risk communication, hand hygiene practices, social distancing, quarantine, and isolation to prevent the spread of COVID-19, closing of bridges linking Khartoum cities, and suspension of prayers in mosques and churches as well as complete and partial lockdown (Kunna, 2020). The country also announced the full closure of educational institutions in Sudan from April to September 2020, including public and private universities (Humanitarian Response, 2020). The implementation of these precautions was complicated by the weakness of the Sudan transition government and fragmented healthcare system (Elhadi *et al.*, 2020; Kunna, 2020).

The pandemic has led to inequities in pharmacy education (Adebisi *et al.*, 2020; Blankenberger & Williams, 2020). This inequity could be attributed to differences in infrastructure, policies, and socioeconomic standards (Adebisi *et al.*, 2020). While some countries are suspending classes without interrupting course content delivery, some universities in Sudan have not adopted e-learning yet as an alternative learning method (Humanitarian Response, 2020). China implemented an emergency initiative called 'Suspending Classes Without Stopping Learning', which typically means switching traditional education to online education (Zhang *et al.*, 2020). Students in Sudan were out of school for six months (Humanitarian Response, 2020). This situation of no formal learning was aggravated by suspension of classes during the previous year in which students missed more than two months of schooling due to Sudan revolution (Humanitarian Response, 2020).

This study aims to elicit the views of pharmacy students in Sudan regarding the impact of the COVID-19 pandemic on their education.

METHODS

Study design, setting, population and sampling technique

The design of the current study is a cross-sectional online self-reported survey conducted over one month during July-August 2020. It involved randomly selected undergraduate students (first year to fifth year) in pharmacy

colleges in Sudan. There are about 14 pharmacy colleges in Khartoum (Sudan) with an admission rate of about 1,800 student per year. All these colleges have five years of study for the bachelor's degree of Pharmacy (Mohamed, 2011). The authors employed convenient sampling technique. The online survey tool was distributed to pharmacy students via major virtual websites, college batch WhatsApp groups, Twitter, and Facebook pages.

Study instrument

The questionnaire used for the study was designed by the authors based on the aim of the study. Its final version contained 11 questions all in one section. Students were asked questions pertaining to depression, level of concentration, motivation to continue their pharmacy study and the impact on their study. The questionnaire was validated and shown a Cronbach's α higher than the threshold value of 0.70, which represent a good internal consistency (George & Mallery, 2003).

Data analysis

Statistical Package for the Social Sciences IBM SPSS Statistics version 26 was employed to analyze student's responses. Data were checked for disturbing outliers and missing values. Cronbach's Alpha was found to be acceptable (0.70) and there was no missing data. The numbers and percentages were calculated. A p -value < 0.05 was considered to be significant. Fisher's exact test (χ^2) was used to identify any meaningful relationship among some participants' responses instead of Chi-square test because there was at least one cell with a count below five (McCrum-Gardner, 2008).

Ethical Consideration

The study was approved by the ethics committee of the Sudanese Medical Research association (SMRA). Written consent was included in the survey tool asking pharmacy students to confirm their willingness to participate in the study.

RESULTS

Demographic of study participants

A total of 137 students completed the questionnaire representing a response rate of 7.6%. The highest rate of participation was among private university students (60.6%), with females representing 74.5% of respondents.

Table I: Students responses to all survey questions

Question	Responses	(%)
1. At the beginning of the pandemic, how long did you think the closure of university will continue?	1 month or less	34.31
	2 to 3 months	29.93
	3 to 5 months	14.60
	6 months or more	21.17
2. Would you be interested in studying if your programme will be offered online?	Yes	45.99
	No	54.01
3. Please select the appropriate measures that would be most helpful as you cope with the COVID crisis.	Continue pharmacy education in the colleges after following all precautionary measures.	48.91
	Distance learning only	26.28
	Hybrid between real teaching and distance teaching.	24.82
4. Describe your concentration.	Extremely bad	11.68
	Not at all bad	14.60
	Not so bad	27.01
	Somewhat bad	27.74
	Very bad	18.98
5. I find myself getting depressed.	Agree	30.66
	Disagree	7.30
	Neutral	32.12
	Strongly Agree	23.36
	Strongly Disagree	6.57
6. My goal for the future have changed.	Agree	25.55
	Disagree	19.71
	Neutral	27.01
	Strongly Agree	16.79
	Strongly Disagree	10.95
7. I am having good communication with my pharmacy college and with my colleagues.	Agree	23.36
	Disagree	25.55
	Neutral	32.12
	Strongly Agree	5.84
	Strongly Disagree	13.14
8. What are your pharmacy study plans now in light of COVID.19.	Cancel studies	2.92
	Continues studies	62.04
	Do not know	25.55
	Postpone studies	9.49
9. Would you be interested in studying if your programme will be offered online?	Yes	45.99
	No	54.01
10. What changes would you take into consideration?	Change my major from pharmacy	2.19
	Going to a different country	20.44
	Not studying at all	4.38
	wait for my pharmacy programme to continue	72.99
11. Rate your motivation level to continue pharmacy degree	Extremely motivated	23.36
	Not motivated	11.68
	Slightly motivated	28.47
	Somewhat motivated	10.95
	Very motivated	25.55

Depression, level of concentration and motivation to continue

Over half of the students (54.0%) found themselves getting depressed and 58.4% described their concentration to study pharmacy was poor. Most participants were motivated to continue their pharmacy education despite the pandemic crisis (85.3%).

Impact on pharmacy education

At the beginning of the pandemic, 34.3% of the students thought the closure of the university would continue for one month or less. In comparison, 21.2% believed that the closure of the university would continue for six months or more. While, 73.0% of students reported that they would wait for their pharmacy programme to continue, about 20.0% decided to go to a different country to continue their pharmacy study, 4.4% are not studying at all, and 2.2% change their major from the pharmacy. Only 5.1% of the students reported that they were not affected by the COVID-19 pandemic, while 53.3% reported that they are strongly affected.

Approximately half of the participants (54.0%) reported that they are interested in continuing their study if their programme of study is offered online. Student communication with their college and future goals were assessed using a five-point Likert scale (Table II). Only 29.2% of the students agreed or strongly agreed that they have good communication with their college, whereas 42.3% agreed or strongly agreed that their goals for the future have changed, and about 27.0% were undecided.

Table II: Students responses to some survey questions

Statement	SD n (%)	D n (%)	N n (%)	A n (%)	SA n (%)
I am having good communication with my pharmacy college and with my colleagues.	18 (13.1)	35 (25.5)	44 (32.1)	32 (23.4)	8 (5.8)
My goals for the future have changed.	15 (11.0)	27 (9.7)	37 (27.0)	35 (25.5)	23 (16.8)
I find myself getting depressed.	9 (6.6)	10 (7.3)	44 (32.1)	42 (30.6)	32 (23.4)

SD=Strongly Disagree; D=Disagree; N=Neutral; A=Agree; SA=Strongly Agree

Nearly half of the students (48.9%) reported that the most appropriate measure to cope with COVID-19 crisis was to

Table III: The relationship between responses to some questions asked and effect of COVID-19

		How have your pharmacy education been affected by the coronavirus (COVID-19) pandemic (N)				p-value (Fisher's exact value)
		Not affected	Slightly affected	Moderately affected	Strongly affected	
I find myself getting depressed. (n)	SD	1	1	4	3	0.011* (25.7)
	D	1	0	6	3	
	N	1	9	16	18	
	A	4	5	10	23	
	SA	0	1	5	28	
I am having good communication with my pharmacy college and with my colleagues (n)	SD	2	1	6	9	0.11 (18.4)
	D	2	4	13	16	
	N	1	6	7	30	
	A	2	3	15	12	
	SA	0	2	0	6	
My goals for the future have changed (n)	SD	2	4	2	7	0.066 (20.0)
	D	2	4	13	8	
	N	0	4	11	22	
	A	2	4	10	19	
	SA	1	0	5	171	

*p < 0.05 SD=Strongly Disagree; D=Disagree; N=Neutral; A=Agree; SA=Strongly Agree

continue pharmacy education in the college after following all precautionary measures whereas, about 26.0% preferred distance learning only, while 24.8% preferred a hybrid between face-to-face teaching and distance teaching as coping measures.

Fisher's exact test (χ^2) was employed to find the relationship between the student answering the questions regarding; depression, future goals, and communication with their colleagues, in comparison to their answers to the question: how have their Pharmacy education been affected by the COVID-19 pandemic. This relationship is shown in Table III. There was a statistically significant association only between the effect of COVID-19 on the participants and their feeling of depression ($p=0.011$).

Discussion

This article presents a novel data set performed among Sudanese pharmacy students to assess the effect of COVID-19 on their pharmacy education and their well-being. The results of this study emphasised the increased female to male ratio among pharmacy students, also highlighted by many previous studies (Taylor & Patton, 2008; Janzen *et al.*, 2013). The rate of participation was higher among private university students (60.6%); this could be due to the growth of private pharmacy education in Sudan. The total number of public pharmacy colleges in

the country is four, namely, Khartoum, Gezira, Omdurman Islamic University, and Al-Neelain (Fathelrahman *et al.*, 2016).

COVID-19 has had a significant effect on students, as reported by many studies on different students' groups in many countries (Adebisi *et al.*, 2020; Parth *et al.*, 2020). A study by (Meo *et al.*, 2020) on the effect of quarantine on medical students' mental wellbeing and learning behaviours reported that medical students' participants exhibited deterioration in their psychological and learning actions. Also, university students in Vietnam reflected that the time spent on studying is less productive during the pandemic (Nguyen *et al.*, 2020). High prevalence of depression was reported among people in southwestern China due to the pandemic lockdown measures (Lei *et al.*, 2020). Similarly, in this study, the authors found that 54.0% of the pharmacy students reported getting depressed, and 58.4% described their concentration to study pharmacy was poor. These results also align with finding from Röhr and colleagues (2020) where COVID-19 measure caused a serious effect on mental health (Röhr *et al.*, 2020). Vanaken and colleagues conducted an online study on university students during the COVID-19 outbreak on March 2020 using Impact of Event Scale, and they reported that COVID-19 pandemic is associated with trauma-related stress symptoms (Vanaken *et al.*, 2020).

Apostol found that over half of the Romanian students' sample studied in his research expect their final college

results to be affected by the COVID-19 pandemic (Apostol, 2020). This study reported the same finding, where 53.3% reported that they are strongly affected, and only 5.1% of the students reported that they were not affected by the COVID-19 pandemic. It was also found that there is a significant association between the effect of COVID-19 on the participants and their feeling of depression. This indicates that social support is important for maintaining mental health during the pandemic crisis (Adebisi *et al.*, 2020; Brooks *et al.*, 2020).

Respondents were optimistic in their expectation regarding the period of study suspension (one month), with the majority willing to wait for their pharmacy program to resume. This high level of optimism in students is promising because Zhang and colleagues reported that optimism and hope inspire the social creativity of college students in China (Zhang *et al.*, 2019). In addition, student's optimism enhances career goals and planning as reported by (Patton *et al.*, 2004).

The present study showed that most participants (85.3%) were motivated to continue their pharmacy education despite the adverse effects of the pandemic on their education. When this finding was assessed in view of literature, similar results were obtained. Female students are more motivated in handling their education (Meo *et al.*, 2020).

It is worth mentioning that almost half of the students preferred to continue traditional face to face teaching over distance learning and hybrid teaching styles. This finding was attributed to the fact that students have barriers to technology, and the majority of them do not have the luxury of quiet space at home with stable electricity and internet connection (Okereke *et al.*, 2020). The current student's technology resources are not sufficient to start online education due to the fact that wireless internet connection is still a challenge in many African countries including Sudan (Okereke *et al.*, 2020). Additionally, previous studies have reported that medical students have low electronic health literacy skills (Dashti *et al.*, 2017).

Approximately 20.0% of the students decided to go to a different country to continue their pharmacy study after the long suspension of education in Sudan, possibly because many other countries have better digital infrastructure, and university programmes were immediately shifted from traditional teaching to virtual teaching (Al-Mohair & Alwahaishi, 2020). In agreement with that, 46% reported that they are interested in continuing their study if their program study will be offered online. Research shows that online delivery and

blended learning of courses have many benefits including students engagement in the learning process, significant cost reduction and the robust student support to classes learning outcomes (Vallée *et al.*, 2020).

Communication with students during the pandemic is crucial because students need reassurance and support with the evolving nature of the crisis and uncertainty about its long-term effects on their study plans. Unfortunately, students reported that there was poor communication with pharmacy colleges. Only 29.2% agreed or strongly agreed that they have good communication with their colleges. College leaders must carefully communicate with students and staff because the wrong points or wrong tone can cause de-motivation or confusion. Prior studies have recommended that colleges staff members keep students engaged in strengthening the teaching-learning and in decreasing the transmission of COVID-19 (Varalakshmi & Arunachalam, 2020).

According to Blankenberger and Williams (2020), COVID-19 has affected higher education globally. COVID-19 is considered as disaster in the education systems, and real impact of COVID-19 pandemic on pharmacy students is still unclear because many questions remain unanswered especially what alternative methods to consider for teaching and training pharmacists especially in a resource-limited setting. Attainment of international education goals became harder with the new challenges generated by the pandemic (Adebisi *et al.*, 2020). Fortunately, education systems in developed countries showed resilience (Okereke *et al.*, 2020). In a country like Sudan, many lessons have been learnt, including an online offering of courses to overcome possible suspension due to pandemics and political instabilities. However, challenges must be carefully investigated. Abdulmajeed and colleagues (2020) identified several factors in Nigeria, including sociocultural and digital infrastructural factors. These factors are very much applicable to Sudan. Fewer challenges facing developed countries as reported, which include the huge gaps in university budget caused by the pandemic. Therefore, offering virtual courses will lead to significant implications for social equity (Hazelkorn & Gibson, 2019).

Limitation

This study was conducted among pharmacy students in Khartoum; if conducted in more cities, the authors may have more widespread information on how COVID-19

affects pharmacy students in the country. In addition, other limitations of our study include the possibility of response bias from participants due to over- or under-reporting of the information provided, which may indicate the need for caution in generalisation of the findings. Low response rate is also another limitation of our study. Despite this, the study still offers a key insight into how the COVID-19 pandemic is affecting pharmacy students in the country.

Conclusion

This study highlighted Sudanese pharmacy students' views on the impact on COVID-19 on their education and well-being. Our study revealed that pharmacy students in Sudan are greatly affected by the pandemic. Despite unprecedented challenges posed by the COVID-19 pandemic, pharmacy students in Sudan are motivated to continue their studies. This is a call to action to improve and invest in e-learning in academic institutions in Sudan.

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