Pharmacy Education (2022) 22(1) 191 - 198
https://doi.org/10.46542/pe.2022.221.191198

RESEARCH ARTICLE

Perceptions of undergraduate pharmacy students towards online assessments used during the COVID-19 pandemic in a public university in Malaysia

Usman Abubakar[1], A'isyah Humaira' Mohd Salehudin[2], Nik Afiqah Athirah Nik Mohd Asri[2], Nur Atiqah Mohammad Rohi[2], Nur Hasyimah Ramli[2], Nur Izzah Mohd Khairuddin[2], Nur Fariesya Saiful Izham[2], Siti Hajar Nasrullah[2], Auwal Adam Sa'ad[3]

[1] Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, Pulau Pinang, Malaysia
[2] Kulliyah of Pharmacy, International Islamic University Malaysia, Kuantan, Pahang, Malaysia
[3] IIUM Institute of Islamic Banking and Finance, International Islamic University Malaysia, Malaysia

Keywords
Emergency remote teaching and learning
Malaysia
Online assessment
Perception
Pharmacy student

Correspondence
Usman Abubakar
Discipline of Clinical Pharmacy
School of Pharmaceutical Sciences
Universiti Sains Malaysia
11800 Pulau Pinang
Malaysia
pharmumma2@gmail.com

Abstract

Objective: To evaluate the perceptions of undergraduate pharmacy students towards online assessments used during the COVID-19 pandemic. **Methods:** A descriptive cross-sectional study was conducted using a self-administered, validated and pre-tested online questionnaire. The data were collected from December 2020 to January 2021 and analysed using descriptive and inferential tests. **Results:** Of the 233 respondents (response rate: 72%), approximately 45% strongly disagree or disagree that online assessment is better than the conventional method of assessment. Only 23.6% were very satisfied or satisfied with online assessment, while 28.8% were very dissatisfied or dissatisfied. About 80% experienced problems with online assessment including failure of portal/online server (63.5%), slow or failure of internet connection (45.5%) and a problem with laptop/gadget (40.8%). Females, final year students, and those who have access to very fast internet speed had significantly better perceptions towards online assessment. **Conclusion:** Undergraduate pharmacy students have negative perceptions towards online assessment used during the COVID-19 pandemic. Most of the students experienced difficulties with online assessment and this may affect their performances. The challenges identified should be addressed in order to improve the use of online assessment in the future.

Introduction

Coronavirus disease 2019 (COVID-19) is a global public health pandemic that has disrupted academic activities in institutions of higher learning across the globe. The infection caused by a novel coronavirus, severe acute respiratory syndrome respiratory virus 2 (SARS-CoV-2), forced national governments worldwide to close schools, restrict movements and social interactions, including lectures and other learning activities in a bid to control the transmission of the infection (Pokhrel *et al.*, 2021). The end of the pandemic was not in sight despite implementing mitigation strategies for some months. As a result, alternative teaching and learning methods, including digital methods of delivering classes and assessments, were introduced (Pokhrel *et al.*, 2021). The transition from face-to-face teaching, learning and assessment to online or virtual methods was sudden, and both students and lecturers were not prepared for full virtual academic activities. This sudden transition and lack of preparedness will have an impact on students' learning experience. Online assessment of students' academic achievement is one

of the major challenges posed by the COVID-19 pandemic in the education section (García-Peñalvo *et al.,* 2021).

Traditionally, pharmacy education involves lectures, tutorials, practical sessions, experiential learning, and final or end of term assessments that are conducted face-to-face. The COVID-19 pandemic has disrupted the traditional system of pharmacy education. Pharmacy education and training, including assessments, are conducted virtually during the COVID-19 pandemic. This transition will have an impact on pharmacy students' learning experience and the quality of pharmaceutical education (Mohamed *et al.*, 2020). Research studies have shown that undergraduate pharmacy students have a negative perception of online teaching and learning methods used during the COVID-19 pandemic (Hilaria *et al.*, 2020). In addition, most undergraduate pharmacy students prefer the conventional objective structured clinical examination (OSCE) to the virtual OSCE (Elnaem *et al.*, 2021).

In Malaysia, the closure of higher education institutions led to a sudden transition to online teaching and learning as implemented through the emergency remote teaching and learning (ERTL). Both students and academic staff were not adequately prepared for remote teaching and learning. In addition, students' assessment was a critical issue for both students and academic staff during the ERTL. There is a lack of data describing the perception of undergraduate students towards the online assessment used during the emergency remote teaching and learning. Therefore, the objective of this study is to evaluate the perceptions of undergraduate pharmacy students towards online final assessment used during the first wave of the COVID-19 pandemic in Malaysia.

Methods

Design

This study is a descriptive, cross-sectional study conducted among undergraduate pharmacy students in a public university located on the eastern coast of Malaysia using a self-administered, online validated and pre-tested questionnaire.

Study settings

This study was conducted in a faculty of Pharmacy of a public university located on the eastern coast of Malaysia. The school offers both undergraduate (a four-year Bachelor of Pharmacy) and postgraduate degree programmes.

Study population

The study population included all second year, third year, and fourth year undergraduate pharmacy students. First year undergraduate students were excluded because they were not involved during the ERTL. There were 360 eligible participants at the time of the study, excluding 109 first year students. The sample size was calculated using the Raosoft sample size calculator, and a sample size of 187 students was calculated. All eligible students were invited to participate in the study through the WhatsApp group of their respective classes. Those who declined the invitation were excluded from the study. A convenient sampling technique was used to recruit the participants.

Study instrument

The study instrument was developed after the review of previous studies on online assessment among students (Khan & Khan, 2019; Elsalem *et al.*, 2020). The questionnaire was prepared in English language and consisted of three sections. Section A collected demographic information and had seven items, while section B collected information on information technology (IT) literacy using seven items. Section C explored students' perceptions towards online teaching, learning and online assessment. The students' perceptions were assessed using a 5-item Likert scale. The questionnaire was validated by three senior lecturers in the faculty of pharmacy, and the questionnaire was modified based on the comments of the lecturers. The average content validity score is 0.84, which is higher than the minimum acceptable value of 0.78. This indicates that all the items can be included in the final instrument (Sangoseni *et al.*, 2013). A pilot study was conducted among 35 undergraduate pharmacy students who were excluded from the final analysis. The data were analysed, and Cronbach's alpha value is 0.60, which falls within the acceptable and satisfactory range (Taber, 2018).

Procedure for online examination

Undergraduate pharmacy students involved in this study reported their perceptions towards their first online end-of-semester examination. Most of the students were not familiar with the new method of examination. The format used for the examinations depends on the course coordinator for each subject and includes multiple-choice questions, essays and objective structured clinical examination (OSCE). Proctoring for the online examination was done through Google Meet, and the students were required to switch on their camera for the first 15 minutes as proof of attendance. Students were not required to

switch on the camera throughout the examination period due to concerns about internet connection problems.

Both multiple-choice questions (MCQ) and essay questions were used, and some subjects used either one or both MCQ and essay questions. One minute was allocated for each MCQ, and each question was presented on one page. Students' answers to the MCQ were automatically submitted at the end of the examination or when the student clicked on the submit button. The students were asked to answer the essay questions in handwritten format. At the end of each examination, there was a five-minute grace for each student to scan and upload their answers. Those who experienced technical problems in the process of uploading their answers were asked to email their answers to the course coordinator immediately.

Data collection

Data collection was conducted using an online validated and pre-tested questionnaire. The online questionnaire was prepared using Google Form. The data were collected from December 2020 to January 2021. The hyperlink of the online questionnaire was sent to the students via WhatsApp through their class representatives. Participation in the study was voluntary, and the students were required to tick an option that indicates consent of participation. A reminder was sent to the students every week. This study's protocol was approved by the university's research ethics committee (reference number: IREC 2020-185).

Data analysis

The data were analysed using descriptive and inferential statistical tests with the Statistical Package for the Social Sciences (SPSS) version 23. The categorical data were presented as frequencies and percentages, while continuous variables were reported using mean and standard deviation or median and range. The responses were transformed into scores using the following rule: five points and one point for strongly agree and strongly disagree, respectively. All negative items were reverse coded. For questions with yes or no options, one point and zero were assigned to yes and no, respectively. Mann Whitney test (for two groups) and Kruskal Wallis test (for three or more groups) were used to determine the differences in perception score based on the students' characteristics. A value of $p < 0.05$ was considered statistically significant.

Results

Demographic characteristics of the respondents

Of the 325 undergraduate students invited, 233 students responded to the questionnaire corresponding to a 72% response rate. More than two-thirds of the respondents were aged 21 – 23 years old (67.4%), and 74.7% are females. There were more students from year four (36.1%) and year two (33.5%). Most of the students lived in urban areas (about 60%), and the majority (91.8%) were at home during the ERTL. Table I shows the demographic characteristics of the students who participated in the study.

Table I: Demographic characteristics of the student who participated in the study (n: 233)

Variable	Frequency	Percentage
Age (in years)		
18 – 20	66	28.3
21 – 23	157	67.4
24 – 26	10	4.3
Gender		
Male	59	25.3
Female	174	74.7
Year of study		
Year 2	78	33.5
Year 3	71	30.5
Year 4	84	36.1
Area of residence		
Urban	139	59.7
Rural	94	40.3
Family income		
Less than RM 2500	48	20.6
RM 2501 – 4850	48	20.6
RM 4851 – 10,970	85	36.5
More than RM 10,970	52	22.3
Place of stay during ERTL		
Home	214	91.8
Campus	18	7.7
Both	1	0.4

ERTL: Emergency Remote Teaching and Learning, RM: Malaysian Ringgit

Information communication technology literacy and access to the internet

The most commonly used devices were laptop (77.3%) and smartphone (15.5%). More than 96.6% of the students had access to the internet from their homes. The students indicated that WiFi (65.7%) and mobile data (60.4%) were the most commonly used types of data. More than one-third of the students rated the internet speed in the location during the ERTL as moderate and fast, respectively. Approximately 59% of the students had sufficient ICT knowledge before the implementation of the ERTL. Table II summarises

the students' access to the internet and the types of devices used during the ERTL.

Table II: Information communication technology literacy and access to the internet

Variable	Frequency	Percentage
Previous online learning experience	166	71.2
Gadgets used for ERTL		
Laptop	180	77.3
Smartphone	36	15.5
Computer	9	3.9
Tablet	8	3.4
Location of internet access		
Home	225	96.6
Library/café	4	1.7
Both	4	1.7
Type of internet access		
WiFi	153	65.7
Mobile data	141	60.4
Mobile hotspot	106	45.5
Speed of internet in a location		
Very fast	15	6.4
Fast	100	42.9
Moderate	107	45.9
Slow	9	3.9
Very slow	2	0.9
Frequency of difficulty with online learning		
Always	4	1.7
Most times	20	8.6
Occasionally	136	58.4
Rarely	72	30.9
Never	1	0.4
Have sufficient knowledge of ICT before ERTL	137	58.8

ERTL: Emergency Remote Teaching and Learning, ICT: Information communication technology

Perception of undergraduate pharmacy students towards online assessment during the COVID-19 pandemic

About 45% of the students disagreed/strongly disagreed that online assessments were better than the conventional method of assessment before the pandemic. However, 18% of the students agreed/ strongly agreed that online assessments were better than conventional assessments. More than 50% of the students indicated neutral when asked whether online assessment improved their academic performance. More than one-third of the students strongly agreed/agreed that ERTL had a negative impact on their academic performance. Most of the students indicated neutral (47.6%) while 23.6% and 28.8% were very satisfied or satisfied and very dissatisfied or dissatisfied with online assessment, respectively. Approximately 80% of the students encountered problems during online assessments, and the most common problem was a problem with 'italeem' (the university online educational system) server (63.5%). This was followed by lack of conducive environment (46.4%), failure/slow internet connection (45.5%) and problems with laptop/gadget (40.8%). Table III shows the perception of the students towards online assessment during the COVID-19 pandemic.

Table III: Perceptions of undergraduate pharmacy students towards online assessment

Variable	Frequency	Percentage
Online assessment is better than face-to-face assessment		
Strongly agree	8	3.4
Agree	34	14.6
Neutral	87	37.3
Disagree	69	29.6
Strongly disagree	35	15.0
Online assessment improve academic performance		
Strongly agree	6	2.6
Agree	42	18.0
Neutral	125	53.6
Disagree	36	15.5
Strongly disagree	24	10.3
ERTL has a negative impact on academic performance		
Strongly agree	24	10.3
Agree	71	30.5
Neutral	107	45.9
Disagree	28	12.0
Strongly disagree	3	1.3
Level of satisfaction with online assessment		
Very satisfied	2	0.9
Satisfied	53	22.7
Neutral	111	47.6
Dissatisfied	60	25.8
Very dissatisfied	7	3.0
Timely notification regarding online assessment		
Strongly agree	33	14.2
Agree	101	43.3
Neutral	56	24.0
Disagree	31	13.3
Strongly disagree	12	5.2
Revision period is adequate		
Strongly agree	2	0.9
Agree	10	4.3
Neutral	1	0.4
Disagree	89	38.2
Strongly disagree	131	56.2
Online assessment is a reliable method of assessment		
Strongly agree	8	3.4
Agree	34	14.6
Neutral	140	60.1
Disagree	40	17.2
Strongly disagree	11	4.7
Experience difficulty during an online assessment	186	79.8

Table III: Perceptions of undergraduate pharmacy students towards online assessment (con't)

Variable	Frequency	Percentage
Types of difficulty experienced during online assessment		
Problem with italeem server	148	63.5
Unconducive surrounding	108	46.4
Failure/slow internet connection	106	45.5
Problem with laptop/gadget	95	40.8
Problems with submission of answers	89	38.2
Others	3	1.3

ERTL: Emergency Remote Teaching and Learning

Perception score and the difference in perception score among the students

The median perception score among the students was 19 (range: 9–27) out of 35. This indicates that the students have a moderate perception towards online assessment used during the ERTL period. There was no significant difference in the median perception score based on age, area of residence, location during ERTL and previous learning experience.

Female students had a better perception towards online assessments than male students (median score: 18 [9–25] *vs* 19 [11–27]; p=0.005). The median perception score was significantly higher among year four students compared to year two and year three students. Also, students with very fast internet speed had a better perception towards online assessment compared to very slow and slow internet speed. Table IV demonstrates the perception score and the difference in score based on students' demographic characteristics.

Discussion

The current study assessed the perceptions of undergraduate pharmacy students towards online assessments used during the COVID-19 pandemic. Most of the students had previous online learning experiences before the implementation of the ERTL, and this could facilitate the students' adaption during the ERTL implementation. It was found that laptop is the most commonly used gadget among the students, and this was not consistent with a study conducted among medical students in India and Pakistan in which mobile phone is the main gadget used for online learning (Abbasi *et al.*, 2020; Shetty *et al.*, 2020).

Table IV: Difference in median perception score toward online assessment among undergraduate pharmacy student

Variable	Median score (Range)	*p*-value
Age (in years)		0.608*
18 – 20	19 (9 – 27)	
21 – 23	19 (11 – 27)	
24 – 26	19.5 (15 – 27)	
Gender		**0.005#**
Male	18 (9 – 25)	
Female	19 (11 – 27)	
Year of study		**0.033***
Year 2	18 (9 – 27)	
Year 3	18 (11 – 27)	
Year 4	20 (11 – 27)	
Area of residence		0.734#
Urban	19 (11 – 27)	
Rural	19 (9 – 26)	
Family income		**0.041***
Less than RM 2500	19 (9 – 27)	
RM 2501 – 4850	20 (12 – 27)	
RM 4851 – 10,970	19 (11 – 25)	
More than 10,970	18 (10 – 26)	
Place of stay during ERTL		0.518#
Home	19 (9 – 27)	
Campus	18.5 (11 – 27)	
Previous online learning experience		0.341#
Yes	19 (9 – 27)	
No	19 (12 – 27)	
Gadgets used for ERTL		0.111*
Laptop	19 (10 – 27)	
Smartphone	20 (9 – 27)	
Computer	17 (12 – 27)	
Tablet	20 (19 – 24)	
Location of internet access		0.301*
Home	19 (9 – 27)	
Library/café	18 (12 – 19)	
Both	17.5 (12 – 22)	
Speed of internet in location		**0.014***
Very fast	20 (10 – 25)	
Fast	19.5 (11 – 27)	
Moderate	18 (9 – 27)	
Slow	18 (12 – 23)	
Very slow	16 (13 – 19)	
Frequency of difficulty with online learning		**0.030***
Always	17.5 (9 – 25)	
Most times	16.5 (11 – 27)	
Occasionally	19 (10 – 27)	
Rarely	19 (11 – 27)	
Have sufficient knowledge of ICT before ERTL		0.050#
Yes	19 (9 – 27)	
No	20 (11 – 27)	

ERTL: Emergency Remote Teaching and Learning, ICT: Information communication technology. #Mann Whitney test, *Kruskal Wallis test.

About 50% of the students did not have access to good internet connections during the ERTL, and more than one-third did not have sufficient knowledge of information communication technology before the ERTL. This indicates a deficiency in both infrastructure and technology-related competence among the students.

The current study found that most students have a negative perception of online assessments used during the COVID-19 pandemic. This is not consistent with the result of a previous study (Huda *et al.*, 2020). Online assessment is considered to be stressful by students as it assesses both students' knowledge of a subject and their computer competency skills (Huda *et al.*, 2020). A previous study demonstrated that students require a certain level of information technology-related competence to navigate through online assessment (Premila & Singh, 2020).

The stress of learning how online assessment works and preparing for examination at the same time, coupled with the problems encountered by the students during the online assessment, could explain their negative perception towards online assessment. It was found that more than two-thirds of the students encountered some problems with online assessment used during the COVID-19 pandemic, including the failure of the university's online learning management system ('italeem'), lack of conducive environment for examination, failure/slow internet connection and the problem with gadget used for online assessment. In addition, the sudden transition to online assessment, lack of adequate training for students regarding computer skills such as typing skills and familiarity with the process of submitting answers during the online assessment are possible factors that could affect students' perception towards online assessment (Rahim *et al.,* 2020).

Gradual transition to online assessment coupled with the provision of technological infrastructure and training are proposed as strategies to increase students' acceptance of online assessment (Khan & Khan, 2019). In the current scenario, online teaching and learning and online assessment are temporary solutions to the disruption caused by COVID-19; however, these strategies could be used in hybrid mode in the post-pandemic era. Therefore, higher education institutions should consider training both students and staff to prepare them against future events that can disrupt educational activities (Tuah & Naing, 2021). In addition, the university management should provide sufficient information technology infrastructure that can accommodate both students and staff to ensure the smooth integration of online assessment into higher education.

This study found that more than two-thirds of the students indicated either neutral or dissatisfied/ strongly dissatisfied with the online assessment. This implies that most of the students were not satisfied with the online assessment, and this could reflect the lack of preparedness among the students. In addition, the instructions, types of questions and the procedure involved in online assessment may be different in some instances from the conventional examinations previously used by the students. Evidence has shown that students are initially anxious about online assessment because they do not know how it works (Premila & Singh, 2020). However, detailed instructions, adequate training and trial sessions to familiarise students with how online assessment works will relieve students' anxiety (Premila & Singh, 2020). Although most students agreed that notification regarding the use of online assessment during the pandemic was timely, however majority of the students disagreed that the revision week provided before the examination was inadequate. This could also explain the students' lack of satisfaction with the online assessment. The validity and reliability of an online assessment is an area of concern (Tuah & Naing, 2021), and students in the current study indicated divergent opinions regarding the reliability of this method of assessment. Less than one-third of the students agreed that online assessment was reliable, and the reasons for this result was unclear.

Female students were found to have better perceptions towards online assessment than their male counterparts. A previous study revealed that female students were grittier and more resilient than males, and this implies that females were more likely to sustain interest and preserve to reach their goals (Abubakar *et al.*, 2021a; Abubakar *et al.*, 2021b). In this context, female students are more likely to build their technology-related competencies and prepare for online examinations than male students. The difference could also be attributed to the higher percentage of female respondents in the current study. The result revealed that fourth year students had better perception scores compared to second and third year students. This is because fourth year students may have been exposed to more online quizzes before the pandemic and are more acclimatised with how online assessment works. Therefore, all students should be exposed to some technology-related training to build students' competence to conduct online teaching and learning and online assessment smoothly.

The study also found that those who had access to very fast and fast internet connections had higher perception scores compared to those with slow and very slow connections. This highlights the importance

of access to good and stable internet connections among students to avoid discriminating against students with poor internet connections. A previous study reported that educators should consider differences in access and quality of internet connection among students when preparing online assessments (Rahim *et al.*, 2020). In addition, those who rarely or occasionally experienced problems during online assessment had significantly higher scores than those who had problems always or most times. This implies that educators should focus on addressing the challenges students experience during an online assessment to improve students learning experience and improve their perception towards online assessment.

The current study has a number of limitations, including the use cross-sectional study design, which has lower power in confirming the association between variables. In addition, the study was conducted in a single university and had a relatively small sample size. These factors could affect the generalisability of the results. Furthermore, the responses are self-reported and are liable for response bias. Moreover, the study is liable to response bias as only those with interest in online assessment may complete the questionnaire. Despite these limitations, the study provides an insight into the perspectives of undergraduate pharmacy students towards online assessment used during the COVID-19 pandemic.

Conclusion

Overall, undergraduate pharmacy students have negative perceptions towards online assessment implementation during Emergency Remote Teaching and Learning due to the COVID-19 pandemic. Most of the students experienced some problems during online assessments, including failure of the university online management system, unconducive surroundings, lack of good and stable internet and problems with gadgets used for online assessments. Female students, those with access to very fast/fast internet connections, those who experienced fewer problems had significantly better perceptions towards online assessments. Higher education institutions should provide basic technological infrastructure, training and trial sessions for undergraduate students for smooth conduct of the online assessment.

References

Abbasi S, Ayoob T, Malik A, Memon S.I.(2020) Perceptions of students regarding E-learning during Covid-19 at a private medical college. *Pakistan Journal of Medical Sciences*.;**36**(COVID19-S4): S57. https://doi.org/10.12669/pjms.36.COVID19-S4.2766

Abubakar U., Azli N.A., Hashim I.A., Kamarudin N.F., Latif N.A., Badaruddin A.R., Razak M.Z., Zaidan N.A. (2021) Association between grit and academic achievement among undergraduate pharmacy students in Malaysia. *Currents in Pharmacy Teaching and Learning.* **13**(5):550-5. https://doi.org/10.1016/j.cptl.2021.01.013

Abubakar U., Azli N.A, Hashim I.A., Kamarudin N.F., Latif N.A., Badaruddin A.R., Razak M.Z., Zaidan N.A.(2021) The relationship between academic resilience and academic performance among pharmacy students*. Pharmacy Education*. **21**:705-12. https://doi.org/10.46542/pe.2021.211.705712

Elnaem M.H., Akkawi M.E., Nazar N.I., Ab Rahman NS, Mohamed M.H.(2021) Malaysian pharmacy students' perspectives on the virtual objective structured clinical examination during the coronavirus disease 2019 pandemic. *Journal of Educational Evaluation for Health Professions.* **18**. https://doi.org/10.3352/jeehp.2021.18.6

Elsalem L, Al-Azzam N., Jum'ah A.A., Obeidat N., Sindiani A.M., Kheirallah K.A.(2020). Stress and behavioral changes with remote E-exams during the Covid-19 pandemic: A cross-sectional study among undergraduates of medical sciences. *Annals of Medicine and Surgery*. **60**:271-9. https://doi.org/10.1016/j.amsu.2020.10.058

García-Peñalvo F.J., Corell A, Abella-García V, Grande-de-Prado M.(2021) Recommendations for Mandatory Online Assessment in Higher Education During the COVID-19 Pandemic. In *Radical Solutions for Education in a Crisis Contex*t (pp. 85-98). Springer, Singapore. https://doi.org/10.1007/978-981-15-7869-4_6

Hilaria M, Tenda P.E., Mandala M.S, Makoil S.(2020) Perceptions of pharmacy students at a health polytechnic of online learning during COVID-19 pandemic: Innovation in learning assessment. *Pharmacy Education.* **21**(2). https://doi.org/10.46542/pe.2020.202.2122

Huda S.S, Kabir M, Siddiq T. (2020) E-Assessment in Higher Education: Students' Perspective. *International Journal of Education and Development using Information and Communication Technology*. **16**(2):250-8

Khan S, Khan R.A.(2019) Online assessments: Exploring perspectives of university students. *Education and Information Technologies*. **24**(1):661-77. https://doi.org/10.1007/s10639-018-9797-0

Mohamed M.H., Mak V, Sumalatha G, Nugroho A.E., Hertiani T, Zulkefeli M, Dorjbal E, Dashbaljir S, Faller E.M., Benosa C.A., Zaini S.(2020) Pharmacy education during and beyond COVID-19 in six Asia-Pacific countries: Changes, challenges, and experiences. *Pharmacy Education*. **20**(2):183-95. https://doi.org/10.46542/pe.2020.202.183195

Pokhrel S,& Chhetri R.(2021) A literature review on impact of COVID-19 pandemic on teaching and learning. *Higher Education for the Future*. **8**(1):133-41. https://doi.org/10.1177/2347631120983481

Premila S.P,& Singh G.S.(2020) A Study of the Use of Online Assessments in a Blended Learning Environment in a Private Higher Education Institution in the Klang Valley. *ASEAN Journal of Open Distance Learning*. **12**(1):1-11

Rahim A.F(2020). Guidelines for online assessment in emergency remote teaching during the COVID-19 pandemic. Education. *Medicine Journal*. **12**(3). https://doi.org/10.21315/eimj2020.12.2.6

Sangoseni O, Hellman M, Hill C. (2013) Development and validation of a questionnaire to assess the effect of online learning on behaviors, attitudes, and clinical practices of physical therapists in the United States regarding evidenced-based clinical practice. *Internet Journal of Allied Health Sciences and Practice*. **11**(2):7. https://doi.org/10.46743/1540-580X/2013.1439

Shetty S, Shilpa C, Dey D, Kavya S (2020). Academic Crisis During COVID 19: Online Classes, a Panacea for Imminent Doctors. *Indian Journal of Otolaryngology and Head & Neck Surgery.* 1-5. https://doi.org/10.1007/s12070-020-02224-x

Taber K.S.(2018) The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education.* **48**(6):1273-96. https://doi.org/10.1007/s11165-016-9602-2

Tuah N.A., & Naing L.(2021) Is online assessment in higher education institutions during COVID-19 pandemic reliable?. *Siriraj Medical Journal*. **73**(1):61-8. https://doi.org/10.33192/Smj.2021.09