Effect Of A Web-Based Educational Program On Nursing Students' Levels Of Knowledge And Self-Efficacy Regarding Corona Virus (Covid-19) Prevention

Eman Mohammed Abd El-Aziz[1] , Amany Salama Ayoub[2] , Helalia Shalabi Mohamed[3]

[1]Assistant professor of Medical- Surgical Nursing, Faculty of Nursing, Kafr El-Sheikh University, ElGeish St, Kafr El-Sheikh city, Egypt, ORCID no. 0000-0002-5275-6008

[2]Assistant professor of Nursing Education Faculty of Nursing, Cairo University, Kasr El Ainy, Cairo city, Egypt, ORCID no. 0000-0003-2635-6761

[3]Assistant professor of community health Nursing, Faculty of Nursing, Cairo University, Egypt, Assistant professor of community health Nursing, Faculty of Nursing, Kuwait, PAAET. ORCID no. 0000-0002-8178-6847

Abstract:

The aim of the current study is to examine the effect of a web-based educational program on nursing students' levels of knowledge and self-efficacy regarding corona virus (covid-19) prevention.

Methods: A quasi-experimental design with pre-post assessment was adopted to achieve the aim of the study. The study was conducted at a selected Faculty of Nursing, Egypt. The study sample included 200 undergraduate nursing students from first to fourth academic level. A self-administered online questionnaire was utilized to collect data.

Results: Newspapers, TV and Radio followed by social media were the most frequently reported sources of COVID-19 information (70% &65% respectively). Preprogram, only 12% of studied students had satisfactory level of knowledge. Concerning their level of self-efficacy, 37% of studied students had high level and 14% of them had moderate level regarding COVID- 19. While post program, the findings pointed to obvious improvements of studied students' levels of knowledge and self-efficacy with statistically significant relations (p-value <0.001). There is a statistically significant relation between studied students' knowledge scores and their level of self-efficacy regarding COVID-19.

Conclusion: the web-based educational program used in this study significantly improved the nursing students' knowledge and self-efficacy regarding coronavirus (COVID-19) prevention.

Keywords: COVID-19 prevention, knowledge, Nursing students, Self-Efficacy, Web-Based Educational program

Introduction:

An epidemic or a pandemic is a widespread outbreak of an infectious disease in a population or around the globe, respectively **(World Health Organization,2010).** In December 2019, the COVID-19 outbreak first detected in Wuhan, China. On January 30, 2020, the World Health Organization recognized it as a Public Health Emergency of International Significance **(WHO, 2020a)** then it was proclaimed as a pandemic on March 11, 2020. **(World Health Organization, 2020b).** It has prompted a worldwide shutdown, quarantine, and some restrictions due to the virus's daily increasing cases and deaths **(Atalan, 2020).** A number of researchers have demonstrated various impacts of the pandemic which include; a serious health crisis, social, economic, and political ones **(Bosveld et al., 2020),** psychological demands on public, especially healthcare workers **(Dincera & Inangil, 2020),** negative effect on university students' mental health **(Jiang, 2020 & Savage et al., 2020)** and on their psychological health **(Marques et al., 2020),** finally, increase in health misinformation **(MacFarlane et al., 2021)** which was associated with frequent usage of social media during the pandemic **(Su, 2021).** Moreover, COVID-19 has turned into a worldwide health emergency **(Zhong et al., 2021).** According to WHO Weekly epidemiological update -on 27 January 2021, there have been over 98.2 million confirmed cases and over 2.1 million deaths worldwide since the pandemic's emergence **(WHO, 2021).**

COVID-19 can be viewed as a pivotal moment in terms of the most effective methods and strategies for preventing new epidemics, health-care protocols as well as the education of future health-care workers **(Cervera-Gasch et al., 2020).** Education must be improved to ensure that students receive sufficient education in infection prevention and control, as well as the ability to cultivate the skills and attitudes necessary to care for infected patients during a pandemic **(Goni-Fuste et al., 2021).** Due to the current global pandemic situation, there is a greater need for increased understanding of COVID-19's clinical presentation, spread, prevention, and management **(Gohel et al., 2021).** In addition, online teaching and learning during the covid -19 pandemic is important **(Escalera-Antezana et al., 2020 & Haslam, 2021).** Furthermore, in the context of covid-19, recent studies recommended provision of health education program whether in general population **(Hossain et al., 2020, Zhong et al., 2020, Ferdous et al, 2020, Alahdal, Basingab & Alotaibi, 2020)** or among nursing students, where education is reported as a major concern after analysis of various studies that examine nursing students during emerging epidemics. Moreover, research suggests that students' awareness of infection prevention and control strategies has an effect on their willingness to work during a pandemic outbreak **(Goni-fuste et al., 2021).** Health care students can play an important role in raising community awareness of the pandemic's severity **(Gohel et al., 2021).** On the other hand, nursing students demonstrated a deep demand to be heard, prepared, and supported during the COVID-19 epidemic **(Ulenaers et al., 2021).**

Despite the fact that competent conduct is primarily dependent on the acquisition of knowledge and skills, it is clear that students' self-efficacy plays a predictive and mediating role in terms of their achievements, motivation, and learning. Thus, it appears critical that higher education institutions consider enhancement of students' self-efficacy (**Dinther et al., 2011**). The coping strategy of remaining optimistic and problem solving was predicted by self-efficacy, which had a positive main impact. Self-efficacy is a valuable psychological resource for coping with stress. (**Zhao et al., 2015**). Self-efficacy is viewed as a vital outcome of nursing education because it has been related to a smoother transition from student to nurse practitioner (**George, 2017**). Adolescents' self-efficacy was the strongest predictor of protective behaviors during the covid-19 pandemic, even when they minimized the risk of the disease (**Fathian- Dastgerdi et al., 2021**). In view of all that has been mentioned so far, this study aims to contribute to this growing area of research through the following aim.

Aim of the study:

The aim of the current study is to examine the effect of a web-based educational program on nursing students' levels of knowledge and self-efficacy regarding corona virus (covid-19) prevention.

Hypothesis:

Nursing students' levels of knowledge and self-efficacy regarding corona virus (covid-19) prevention improves after participation in web-based educational program

Methods:

Research design:

A quasi-experimental design with pre-post assessment was adopted to achieve the aim of the study.

Setting:

The study was conducted at a selected Faculty of Nursing, Egypt.

Subjects:

All undergraduate student nurses enrolled in the study setting's program (Bachelor of Science in nursing) from the first to the fourth academic level were targeted for this educational program. The total number of enrolled undergraduate student population was 200.

G-power was used to perform power analysis to calculate sample size.

Tools of data collection:

A self-administered online questionnaire form containing informed consent at the beginning of the online questionnaire was utilized to collect data. The questionnaire was designed and developed by the researchers after extensive literature review, it consists of four parts;

A. Student's characteristics: age, gender, nationality, marital status, part time employment, academic year, student's GPA

B. Sources of information about COVID-19: These included, newspapers, TV and Radio, social media, official health organization websites e.g. WHO & ministry of health, family and friends, online training courses and scientific articles and journals

C. Assessment of Knowledge about COVID-19: It includes a total number of 28 questions; 8 related to information about disease, 10 related to Coronavirus preventive measures, and 10 related to preventive measures in the health facility. These questions were answered on a multiple choice, true/false. A score of one was given for correct answer, and zero for the incorrect answer. The total scores were recorded in percentage format. Satisfactory knowledge was counted from 60% -100% and unsatisfactory from below 60%.

D. Self-efficacy for COVID-19 Preventive Measures Scale: to measure confidence in one's ability to perform COVID-19 preventive measures. It composed of total number of 21 questions; 5 related to hand hygiene, 3 related to respiratory hygiene, 2 related to social distance, 8 related to cleaning and disinfecting surfaces, and 3 related to preventive measures in health facility. The scale has 3-point Likert scale (low: less than 50%, moderate: 50-75% and high: more than 75%).

Tool validity and Reliability:

For the content validity, the questionnaire was reviewed by three nursing faculty experts to test the readability of the questionnaire, accuracy, question sequence, comprehensiveness of the questions and relevance of the items in the scales. The reliability analysis was done. The analysis yielded an average Chronbach's alpha of 0.735 for the entire knowledge scale, and 0.957 for the entire self-efficacy scale indicating sufficient internal consistency.

Pilot study:

Pilot study was done on 10% of the study sample to test the study tool in terms of clarity as well as the applicability of the scale. Students involved in the pilot study were not included in the main study sample.

Program implementation:

After extensive literature review; a designed educational program content regarding coronavirus (COVID-19) prevention was developed. It was based mainly on WHO and CDC guidelines. The instructional materials were presented in power point presentation form in addition to educational videos for some practical procedures e.g., hand hygiene, wearing and removing of different personal protective equipment. The educational program calendar was formed consequently. Program implementation was conducted from April 2020 to July 2020.

Due to Covid-19 pandemic situation and subsequent suspension of academic activities, restricted movement and required safety recommendations; all program activities were achieved

through online means. Data was collected using an online questionnaire developed by means of Google form (pre and post-tests). We approached the studied students through Zoom meeting to allow interactive presentation of instructional materials and answering student's questions.

The enrollment of the studied students for the program was done through WhatsApp group to inform the participants with the purpose of the study, a brief description of the study questionnaire, instructions to fill it by using Google form and sharing links for questionnaire and the educational sessions as well as time schedules for them.

Studied students were divided into 8 groups, each group included 25 students. Each group received two hours weekly session as following:

First session: Basic knowledge about Covid-19 e.g., virus, susceptible host, mode of transmission, incubation period, most common symptoms and warning signs that require immediate medical attention. As well as preventive measures e.g., hand and respiratory hygiene practices, social distance, things we should avoid, cleaning and disinfecting surfaces, precautions should be taken when entering the home to prevent the spread of Covid-19, and physical activity. In addition to the difference between quarantine and medical (sanitary) isolation, and what should you do if you think you may have COVID-19.

Second session: It contained preventive measures in the health facility such as the five moments of hand hygiene, hand hygiene procedures, personal protective equipment, dealing with suspected patients, dealing with medical supplies and equipment, and cleaning and disinfection of isolation rooms.

Due to the fact that forgetfulness and remembering factors do not interfere and to assess the retention of knowledge, students who had participated in the pre-test questionnaire were invited to participate in post-test four weeks after implementing the educational program.

Ethical considerations:

After obtaining official permissions, all participants were informed about the purpose and nature of the study and were assured that participation in the study is voluntary and the possibility to withdraw at any time. The researcher confirmed that the information they gave would not affect their grade in courses and that data would be utilized only for the purpose of scientific study. Confidentiality was guaranteed by assigning each subject a code number.

Statistical analysis:

Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Chronbach's alpha coefficient was calculated to assess the reliability of the developed tool. For descriptive statistics, numbers and percent were used to describe the students' characteristics, as well as the study variables. Chi- square test was used to compare students' knowledge as well as students' self-efficacy pre and post program and to test the relation between their level of

knowledge about COVID-19 as well as their self-efficacy and students' characteristics. Statistical significance was considered at p-value <0.05.

Results:

Table (1): Characteristics of studied students (N=200)

Items	No.	%
Age:		
▪ 18 -	54	27.0
▪ 20-23	146	73.0
Gender:		
▪ Male	45	22.5
▪ Female	155	77.5
Nationality:		
▪ Egyptian	193	96.5
▪ Not Egyptian	7	3.5
Marital status		
▪ Single	192	96.0
▪ Married	8	4.0
Part time employment		
▪ Not working	178	89.0
▪ working	22	11.0
Academic year:		
▪ First	42	21.0
▪ Second	35	17.5
▪ Third	93	46.5
▪ Fourth	30	15.0
Students' GPA:		
▪ Pass	24	12.0
▪ Good	89	44.5
▪ Very good	71	35.5
▪ Excellent	16	8.0

As regards to characteristics of studied students **(table 1),** the findings shows that the age of participants ranged between 18-23 years old. 77.5% of them were female, 96% were single and 96.5% are Egyptian. Regarding part time employment, only 11% had a part time job. Also, most of the studied students (46%) were in third academic year and 44% of them had good grade in their GPA.
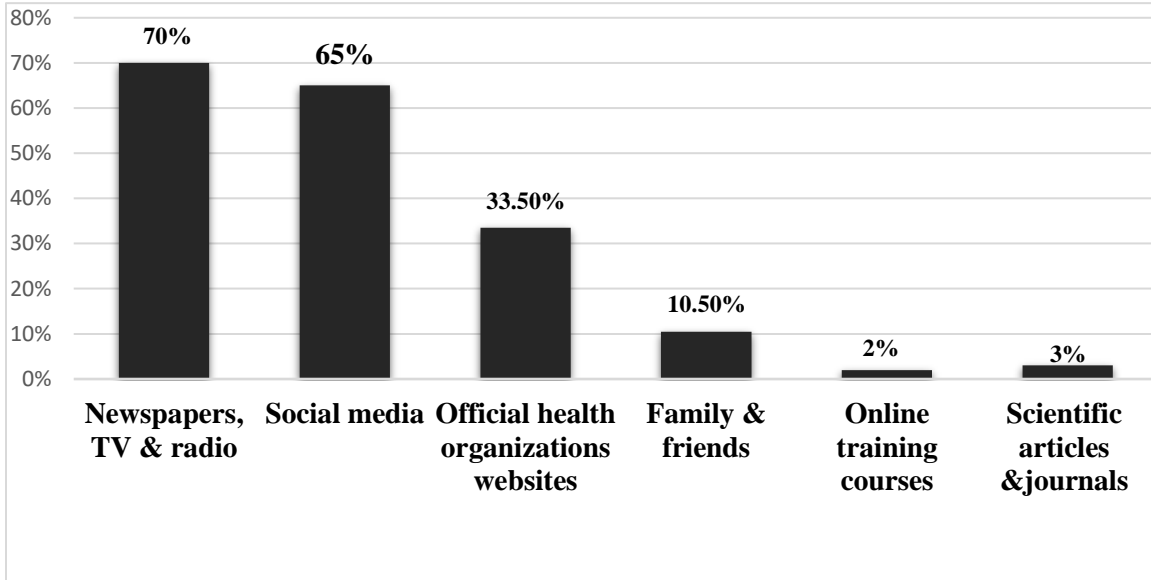
Figure (1): Sources of information about COVID -19 as reported by studied students

Figure (1): Among different sources of information about COVID -19, newspapers, TV and Radio were primarily reported by studied students (70%) followed by social media (65%). Also, 33.5% accessed official health organization websites; whereas, in relation to remaining items, minority of participants reported that family and friends, training courses and scientific articles were used as a source of information (10.5%, 2%, 3% respectively).

Table (2): Studied students' knowledge and self-efficacy regarding COVID- 19 throughout the program (N=200)

	Knowledge				Chi square	p-value
	Unsatisfactory		**Satisfactory**			
	No.	%	No.	%		
▪ **Preprogram**	176	88.0	24	12.0	176.0	0.0001*
▪ **Post program**	44	22.0	156	78.0		
	Self-efficacy					
	Low		**Moderate**		**High**	
	No.	%	No.	%	No.	%	
▪ **Preprogram**	98	49	28	14	74	37	93.7	0.0001*
▪ **Post program**	21	10.5	11	5.5	168	84		

*Significant at p-value<0.05

Table (2): Presents studied students' knowledge and self-efficacy regarding COVID- 19 throughout the program. According to the findings, in preprogram only 12% of studied students had satisfactory level of knowledge. Concerning their level of self-efficacy, 37% of studied

students had high level and 14% of them had moderate level regarding COVID- 19. While post program, the findings pointed to obvious improvements of studied students' levels of knowledge and self-efficacy with statistically significant relations (p-value <0.001)

Table (3): Relation between studied students' knowledge and self-efficacy

Knowledge	Self-efficacy				Chi-square	P-value
	Low	**Moderate**	**High**	**Total**		
Unsatisfactory	98	25	53	176		
	55.7%	14.2%	30.1%	100.0%	32.2	0.0001*
Satisfactory	0	3	21	24		
	0%	12.5%	87.5%	100.0%		
Total	98	28	74	200		
	49.0%	14.0%	37.0%	100.0%		

*Significant at p-value<0.05

Table (3): Displays relation between studied students' knowledge and self-efficacy. The findings revealed a statistically significant relation between studied students' knowledge scores and their level of self-efficacy regarding COVID-19.

Discussion:

The results of the current study revealed that TV and social media were the most frequently reported sources of COVID-19 information. This finding is in support to prior study that have noted the importance of social media as the main way to access information during the COVID-19 pandemic (**Kaya, 2020**). Meanwhile, consistent with similar studies in other countries, in which television and social media were reported as the primary sources for COVID-19 information
(**Ejeh et al., 2020, Alzoubi et al., 2020, Zhong et al., 2020, Saqlain, 2020, Bhagavathula et al., 2020, Gohel, 2021**)

Preprogram, it was noteworthy that only a minority of studied students had satisfactory level of knowledge regarding COVID- 19. Possible explanations for this result may be due to conducting the study in early stage of the epidemic with considerable amount of information about the virus is unknown in addition to lack of adequate sources of valid information or authentic sources as most of participants reported using social media as a source of information for them. Also, it might be related to stress and widespread fear and anxiety caused by the threats of covid-19 virus, social barriers and concerns about safety. At the same time, using of online questionnaire which is relatively a new method for students. Our finding concerning students' knowledge goes in the same line with a study in China, about university students which reported that they had insufficient COVID-19 knowledge (**Jiang, 2020**). Similarly, In Bangladesh, an online survey for residents with the majority of the participants were students revealed that less than half of the sample had accurate knowledge regarding COVID-19 (**Ferdous al., 2020**).

In contrast, prior studies in Egypt pointed out to good knowledge about coronavirus among Egyptian public (**Abdelhafiz et al., 2020 & Elgendy et al., 2020**). Moreover, our finding is inconsistent with growing body of researches in various countries that investigated university students' knowledge about COVID-19 which almost of those studies included medical and nursing students. For example, in Jordan (**Alzoubi et al., 2020 & Khasawneh et al., 2020 & Olaimat et al., 2020),** in Iran (**Taghrir et al., 2020**), in Pakistan (**Hussain et al., 2021 & Noreen et al., 2020),** in Spain (**Cervera-Gasch et al., 2020),** in China (**Peng et al., 2020)** and in India (**Gohel et al., 2021)**

Notably, our study findings of post-program, pointed to obvious improvements of studied students' levels of knowledge with statistically significant relations (p-value< 0.001).The efficacy of our intervention could be attributed to the convenience of the presentation because it was online, which facilitate accessing the information with fast, easy way and following the lockdown safety precautions, a genuine willingness to participate because no incentives were given to the study participants, direct communication between researcher and students through Zoom meeting and the using videos to illustrates certain clinical procedures , flexible time schedules. Therefore, these findings highlight the importance of an educational program to help correct gaps in students' knowledge during such critical time; especially that the studied students' knowledge assessment uncovered markedly reduced level regarding covid-19. According to our search, this is the first study in Egypt to examine the effect of a Web-Based Educational program on nursing students' levels of knowledge and self-efficacy regarding coronavirus (COVID-19) prevention.

In this respect, due to lack of related literature, we compared the results of the present study with previous ones about infection control educational intervention for nursing students. Our findings are similar to those previous studies that reported statistically significant improvements in students' knowledge in different countries. Such as Taiwan (**Wu et al., 2009),** China, (**Xiong et al., 2017**) and another two studies in Jordan (**Al-Hussami & Darawad, 2013 & Hassan, 2018).** Furthermore, implementation of an educational program about Ebola virus disease results indicated enhanced knowledge for nursing students (**Ferranti et al, 2016**) and student of healthcare professionals (**Patel et al., 2018).** As regard COVID-19, a study conducted in 41 Bolivian and Colombian cities to assess participants' knowledge of COVID-19 transmission, epidemiology, and symptoms found that the majority of participants' knowledge improved after attending symposia held in hospitals, universities and online for physicians, nurses, medical and nursing students. There has been a substantial increase in awareness about transmission, symptoms, and prevention in Colombia. While there was an overall increase in knowledge in Bolivia, there were no major variations between the before and after periods (**Escalera-Antezana et al., 2020**).

In a study to explore the coping strategy and the effects of self-efficacy of Chinese undergraduate nursing students when they encounter stress in clinical practice, findings revealed that constructive coping mechanisms during stressful situations were used by students with higher

self-efficacy (**Zhao et al., 2015**). In this context, our preprogram results of studied students' self-efficacy indicated that just over one third of them had high level of self-efficacy regarding COVID-19. This result is in accordance with a Chinese study that reported low general self- efficacy in a sample of nursing students (**Chen et al., 2019**). While, another study in UK reported high levels of student nurses' self-efficacy (**Priesack & Alcock, 2015**). Worthy of attention, our post program findings concerning studied students' self- efficacy demonstrated obvious improvement with statistically significant relation (p-value < 0.001). Moreover, there is a statistically significant relation between studied students' knowledge scores and their level of self-efficacy regarding COVID-19. Taking into consideration that self- efficacy can anticipate the future students' practice, this finding obviously supports the value of knowledge about COVID-19 as a key element that students need to be equipped with to improve their self-efficacy.

Generally; consistent with earlier and various set of studies which reported that students' self- efficacy was improved after different interventions. In a study about nursing student's self-efficacy results indicated that students' self-efficacy increased noticeably over the course of a module to deal with difficult patient care situations (**McConville & Lane 2006**). Similarly, according to the findings of an analysis of self-efficacy in higher education, eighty percent of intervention research across a variety of styles of studies and domains showed a strong relationship between an intervention program and students' self-efficacy (**Dinther et al., 2011**). In Jordan, Students who were given high-fidelity simulation training had a higher perception of self-efficacy (**Akhu-Zaheya et al., 2013**). In addition, according to the results of an Indian study, simulation was an efficient teaching and learning process, as post-test self-efficacy of nursing students' competency scores were substantially higher than pre-test scores (**Garner et al., 2020**). Also, following frequent exposure to simulations, there was a statistically significant improvement in nursing students' overall self-efficacy (**Hung et al., 2021**)

Conclusion:
Our findings demonstrated that the studied students' knowledge and self-efficacy assessment uncovered markedly reduced levels regarding covid-19 preprogram. The web-based educational program used in this study was an effective modality as can be seen in findings of post-program which pointed to obvious improvements of studied students' levels of knowledge and self-efficacy with statistically significant relations (p-value< 0.001). Additionally, there is a statistically significant relation between studied students' knowledge scores and their level of self-efficacy regarding COVID-19.

Recommendations:

Drawing on these findings, we recommend that incorporating knowledge about COVID-19 prevention into the curriculum of nursing education programs is crucial to offer an equal opportunity for preparation of future nurses to respond effectively to the pandemic. Moreover,

further studies about effectiveness of online learning as a new teaching approach as well as testing the relation between knowledge and self-efficacy is recommended.

References:

1. Abdelhafiz AS, Mohammed Z, Ibrahim ME, Ziady HH, Alorabi M, Ayyad M and Sultan EA. (2020). Knowledge, Perceptions, and Attitude of Egyptians Towards the Novel Coronavirus Disease (COVID-19). J Community Health, Oct; 45(5), 881-890. https://doi: 10.1007/s10900-020-00827-7.

2. Akhu-Zaheya, L M, Gharaibeh M K and Alostaz, Z M. (2013). Effectiveness of Simulation on Knowledge Acquisition, Knowledge Retention, and Self-Efficacy of Nursing Students in Jordan. Clinical Simulation in Nursing, 9 (9), e335-e342. https://doi.org/10.1016/j.ecns.2012.05.001.

3. Alahdal H, Basingab F and Alotaibi R (2020). An analytical study on the awareness, attitude and practice during the COVID-19 pandemic in Riyadh, Saudi Arabia. J Infect Public Health, Oct;13(10), 1446-1452. https://doi: 10.1016/j.jiph.2020.06.015.

4. Al-Hussami M and Darawad M (2013). Compliance of nursing students with infection prevention precautions: effectiveness of a teaching program. Am J Infect Control Apr; 41(4), 332-6. https://doi: 10.1016/j.ajic.2012.03.029.

5. Alzoubi H, Alnawaiseh N, Al-Mnayyis A, Abu- Lubad M, Aqel A and Al-Shagahin H (2020). COVID-19 - Knowledge, Attitude and Practice among Medical and Non-Medical University Students in Jordan. Journal of Pure and Applied Microbiology,14(1), 17-24.

6. Atalan A (2020). Is the lockdown important to prevent the COVID-9 pandemic? Effects on psychology, environment and economy-perspective. Ann Med Surg, Aug; 56, 38-42. https://doi.org/10.1016/j.amsu.2020.06.010.

7. Bhagavathula AS, Aldhaleei WA, Rahmani J, Mahabadi MA and Bandari DK (2020). Knowledge and Perceptions of COVID-19 Among Health Care Workers: Cross-Sectional Study. JMIR Public Health Surveill, Apr; 30, 6(2), e19160. https://doi: 10.2196/19160.

8. Bosveld M H, van Doorn D., Stassen PM, Westerman D, Bergmans D., van der Horst I. and van Mook W (2021). A Lessons learned: Contribution to healthcare by medical students during COVID-19. J Crit Care, 63,113-116. https://doi.org/10.1016/j.jcrc.2020.09.015.

9. Cervera-Gasch A, González-Chordá V. M and Mena-Tudela D (2020). COVID-19: Are Spanish medicine and nursing students prepared? Nurse Education Today, 92, 104473. https://doi.org/10.1016/j.nedt.2020.104473.

10. Chen J H, Björkman A, Zou J H and Engström M. (2019). Self–regulated learning ability, metacognitive ability, and general self-efficacy in a sample of nursing students: A cross-sectional and correlational study. Nurse Education in Practice, 37, 15-21. https://doi.org/10.1016/j.nepr.2019.04.014.

11. Dincera B and Inangil D (2021). The effect of Emotional Freedom Techniques on nurses' stress, anxiety, and burnout levels during the COVID-19 pandemic: A randomized controlled trial. EXPLORE, 17(2),109-114. https://doi.org/10.1016/j.explore.2020.11.012.

12. Dinther V M, Dochy F and Segers M. (2011). Factors affecting students' self-efficacy in higher education. Educational Research Review, 6 (2), 95-108. https://doi.org/10.1016/j.edurev.2010.10.003.

13. Ejeh F E, Saidu A S, Owoicho S, Maurice N A, Jauro S, Madukaji L and Okon O. (2020). Knowledge, attitude, and practice among healthcare workers towards COVID-19 outbreak in Nigeria. Heliyon, 6 (11), e05557. https://doi.org/10.1016/j.heliyon.2020.e05557.

14. Elgendy MO, El-Gendy AO and Abdelrahim MEA (2020). Public awareness in Egypt about COVID-19 spread in the early phase of the pandemic. Patient Educ Couns, Sep; 5;103(12), 2598–601. https://doi.org/10.1016/j.pec.2020.09.002.

15. Escalera-Antezana J P, Cerruto-Zelaya P E, Apaza-Huasco M, Miranda-Rojas S H, Flores-Cárdenas C A, Rivera-Zabala L et al., (2020). Healthcare workers' and students' knowledge regarding the transmission, epidemiology and symptoms of COVID-19 in 41 cities of Bolivia and Colombia. Travel Medicine and Infectious Disease, 37,101702. https://doi.org/10.1016/j.tmaid.2020.101702.

16. Fathian-Dastgerdi Z, khoshgoftar M, Tavakoli B and Jaleh M (2021). Factors associated with preventive behaviors of COVID-19 among adolescents: Applying the health belief model. Res Social Adm Pharm, 17(10), 1786-1790. https://doi.org/10.1016/j.sapharm.2021.01.014.

17. Ferdous M.Z, Islam M.S, Sikder M.T, Mosaddek ASM., Zegarra-Valdivia JA and Gozal D (2020). Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: An online based cross-sectional study. PLoS ONE, 15(10): e0239254. https://doi.org/10.1371/journal.pone.0239254

18. Ferranti EP, Wands L, Yeager KA, Baker B, Higgins MK, Wold JL and Dunbar SB. (2016). Implementation of an educational program for nursing students amidst the Ebola virus disease epidemic. Nurs Outlook, Nov-Dec; 64 (6), 597-603. https://doi: 10.1016/j.outlook.2016.04.002.

19. Garner S L, Samyappan J, Cyriac R, Vidhya P, Selva F E and Muggalla D S. (2020). Simulation Evaluation: Observation Versus Self-Efficacy Among Nursing Students in India. Clinical Simulation in Nursing, 39, 55-61. https://doi.org/10.1016/j.ecns.2019.11.005.

20. George LE, Locasto LW, Pyo KA and W Cline T (2017). Effect of the dedicated education unit on nursing student self-efficacy: A quasi-experimental research study. Nurse Educ Pract, Mar; 23, 48-53. https://doi: 10.1016/j.nepr.2017.02.007.

21. Gohel K H, Patel P B, Shah P M, Patel J R, Pandit N and Raut A (2021). Knowledge and perceptions about COVID-19 among the medical and allied health science students in India: An online cross-sectional survey. Clinical Epidemiology and Global Health, 9 , 104-109. https://doi.org/10.1016/j.cegh.2020.07.008.

22. Goni-Fuste B, Wennberg L, Martin-Delgado L, Alfonso-Arias C, Martin-Ferreres M L and Monforte-Royo C (2021). Experiences and needs of nursing students during pandemic outbreaks: A systematic overview of the literature. Journal of Professional Nursing,37(1), 53-64. https://doi.org/10.1016/j.profnurs.2020.12.004.

23. Haslam M B. (2021) What might COVID-19 have taught us about the delivery of Nurse Education, in a post-COVID-19 world? Nurse Education Today, 97 ,104707. https://doi.org/10.1016/j.nedt.2020.104707.

24. Hassan Z M. (2018). Improving knowledge and compliance with infection control Standard Precautions among undergraduate nursing students in Jordan. American Journal of Infection Control, 46(3), 297-302. https://doi.org/10.1016/j.ajic.2017.09.010.

25. Hossain M B, Alam Z, Islam S, Sultan S , Faysal M , Rima S Hossain A , Mahmood M M , Kashfi S S , Mamun A , Monia H T and Shoma S S.(2020). Do knowledge and attitudes matter for preventive behavioral practices toward the COVID-19? A cross-sectional online survey among the adult population in Bangladesh. Heliyon, 6(12), e05799. https://doi.org/10.1016/j.heliyon.2020.e05799.

26. Hung CC, Kao H S, Liu H C, Liang H F, Chu T P and Lee B O. (2021). Effects of simulation-based learning on nursing students' perceived competence, self-efficacy, and learning satisfaction: A repeat measurement method. Nurse Education Today, 97 ,104725. https://doi.org/10.1016/j.nedt.2020.104725

27. Hussain T, Gilani US, Khan S and Raza SMM (2021). Assessment of general awareness among Pakistani students regarding COVID-19 outbreak. Child Youth Serv Rev, Feb;121: 105830. https://doi.org/10.1016/j.childyouth.2020.105830

28. Jiang R (2020). Knowledge, attitudes and mental health of university students during the COVID-19 pandemic in China. Children and Youth Services Review, 119, 105494. https://doi.org/10.1016/j.childyouth.2020.105494.

29. Kaya T (2020). The changes in the effects of social media use of Cypriots due to COVID-19 pandemic. Technol Soc, 63, 101380. https://doi.org/10.1016/j.techsoc.2020.101380.

30. Khasawneh AI, Humeidan AA, Alsulaiman JW, Bloukh S, Ramadan M, Al-Shatanawi TN, Awad HH, Hijazi WY, Al-Kammash KR, Obeidat N, Saleh T and Kheirallah KA.(2020). Medical Students and COVID-19: Knowledge, Attitudes, and Precautionary Measures. A Descriptive Study from Jordan. Front Public Health, 8: 253.https://doi.org/10.3389/fpubh.2020.00253

31. MacFarlane D., Tay L Q, Hurlstone M J and Ecker U K H. Refuting Spurious COVID-19 Treatment Claims Reduces Demand and Misinformation Sharing (2021). Journal of Applied Research in Memory and Cognition, 10 (2), 248-258 https://doi.org/10.1016/j.jarmac.2020.12.005.

32. Marques G, Drissi N, Díez I, de Abajo B S and Ouhbi S (2021). Impact of COVID-19 on the psychological health of university students in Spain and their attitudes toward Mobile mental health solutions. Int J Med Inform, 147,104369. https://doi.org/10.1016/j.ijmedinf.2020.104369.

33. McConville S A and Lane AM. (2006). Using on-line video clips to enhance self-efficacy toward dealing with difficult situations among nursing students. Nurse Education Today, 26 (3), 200-208. https://doi.org/10.1016/j.nedt.2005.09.024.

34. Noreen K, Rubab ZE, Umar M, Rehman R, Baig M and Baig F (2020). Knowledge, attitudes, and practices against the growing threat of COVID-19 among medical students of Pakistan. PLoS One. Dec 11,15(12), e0243696. https://doi: 10.1371/journal.pone.0243696.

35. Olaimat AN, Aolymat I, Shahbaz HM and Holley RA. (2020). Knowledge and Information Sources About COVID-19 Among University Students in Jordan: A Cross-Sectional Study. Front Public Health, 8:254. https://doi: 10.3389/fpubh.2020.00254.

36. Patel I, Guy J, Han Y, Marsh W, Pierce R and Johnson M. S. (2018). Effects of Ebola Virus Disease education on student health professionals. Currents in Pharmacy Teaching and Learning, 10 (5), 651-656. https://doi: 10.1016/j.cptl.2018.01.011.

37. Peng Y, Pei C, Zheng Y, Wang J, Zhang K, Zheng Z and Zhu P. (2020). A cross-sectional survey of knowledge, attitude and practice associated with COVID-19 among undergraduate students in China. BMC Public Health, Aug 26; 20(1),1292. https://doi: 10.1186/s12889-020-09392-z

38. Priesack A and Alcock J. (2015). Well-being and self-efficacy in a sample of undergraduate nurse students: A small survey study. Nurse Educ Today, May;35(5), e16-20. https://doi: 10.1016/j.nedt.2015.01.022.

39. Saqlain M, Munir M.M., Rehman S.U., Gulzar A., Naz S., Ahmed Z., Tahir A.H. and Mashhood M (2020). Knowledge, attitude, practice and perceived barriers among healthcare workers regarding COVID-19: a cross-sectional survey from Pakistan. Journal of Hospital Infection, 105(3), 419-423. https://doi.org/10.1016/j.jhin.2020.05.007.

40. Savage M J, James R, Magistro D, Donaldson J, Healy L C, Nevill M and Hennis P J. (2020). Mental health and movement behaviour during the COVID-19 pandemic in UK university students: Prospective cohort study. Mental Health and Physical Activity, 19,100357. https://doi.org/10.1016/j.mhpa.2020.100357.

41. Su Y (2021). It doesn't take a village to fall for misinformation: Social media use, discussion heterogeneity preference, worry of the virus, faith in scientists, and COVID-19-related misinformation beliefs. Telematics and Informatics, 58, 101547. https://doi.org/10.1016/j.tele.2020.101547.

42. Taghrir MH, Borazjani R and Shiraly R (2020). COVID-19 and Iranian Medical Students; A Survey on Their Related-Knowledge, Preventive Behaviors and Risk Perception. Arch Iran Med. Apr 1, 23(4), 249-254. https://doi: 10.34172/aim.2020.06. PMID: 32271598.

43. Ulenaers D., Grosemans J., Schrooten W and Bergs J. (2021). Clinical placement experience of nursing students during the COVID-19 pandemic: A cross-sectional study. Nurse Education Today, 99, 104746. https://doi.org/10.1016/j.nedt.2021.104746

44. WHO (2021) Weekly epidemiological update - 27 January 2021. [cited January, 2021]. Available from: https://www.who.int/publications/m/item/weekly-epidemiological-update---27-january-2021.

45. World Health Organization. (2010). What is a pandemic? [cited July, 2020]. Available at: https:// www.who.int/csr/disease/swineflu/frequently_asked_questions/pandemic/en/

46. World Health Organization. (2020a). Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV). [cited March, 2020]. Available from: https:// www.who.int/news-room/detail/30-01-2020-state   ment-on-the-second-meeting-of-the-internationalhealth-regulations-(2005)-emergency-committeeregarding-the-outbreak-of-novel-coronavirus-(2019- ncov)

47. World Health Organization. (2020b). WHO Director-General's opening remarks at the media briefing on COVID19 - 11 March 2020. [cited March, 2020]. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-11- march-2020

48. Wu CJ, Gardner G and Chang AM (2009). Nursing students' knowledge and practice of infection control precautions: an educational intervention. J Adv Nurs, Oct; 65(10), 2142-9. https://doi: 10.1111/j.1365-2648.2009.05079.x.

49. Xiong P, Zhang J, Wang X, Wu TL and Hall BJ. (2017). Effects of a mixed media education intervention program on increasing knowledge, attitude, and compliance with standard precautions among nursing students: A randomized controlled trial. Am J Infect Control, Apr, 1;45(4), 389-395. https://doi: 10.1016/j.ajic.2016.11.006.

50. Zhao FF, Lei XL, He W, Gu YH and Li DW (2015). The study of perceived stress, coping strategy and self-efficacy of Chinese undergraduate nursing students in clinical practice. Int J Nurs Pract, Aug; 21(4), 401-9. https://doi: 10.1111/ijn.12273.

51. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT and Li Y. (2020). Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. Int J Biol Sci., 16 (10), 1745-1752. https://doi.org/10.7150/ijbs.45221

52. Zhong Y, Liu W, Lee TY, Zhao H and Ji J (2021). Risk perception, knowledge, information sources and emotional states among COVID-19 patients in Wuhan, China. Nursing Outlook, 69(1),13-21. https://doi.org/10.1016/j.outlook.2020.08.005.