



Effect of Telehealth Nursing Intervention on the COVID-19 Protective Measures Awareness and Practice among University Students

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ABSTRACT

Background: Accurate information of students regarding the coronavirus illness (COVID-19), its spread, and precautions are important for limiting an outbreak. Telenursing is considered an efficient approach for combating COVID-19 outbreak. **Aim:** To examine the effect of telehealth nursing intervention on COVID-19 protective measures awareness and practice among university students. **Subjects & Method:** A quasi-experimental research approach was adopted. This research was carried out at non-medical faculties including faculty of Commerce and faculty of Law at Shebin Elkom City, Menoufia University, Egypt. **Subjects:** A convenience sample comprising of 280 university students, aged 18 to 24, from both genders, was obtained using an online Google form. **Tools of data collection:** Two tools were employed: 1. Self-administered structured questionnaire included personal characteristics, and students' awareness about COVID-19. 2. Students' protective measures practice about COVID-19. **Results:** The main findings revealed that 82.2% of studied students had poor awareness about COVID-19 pre telehealth nursing intervention, compared post telehealth nursing intervention, the good awareness level was significantly improved (83.2%). Besides, about three-quarters of students had poor protective measures practice against COVID-19, while 25.4% had good practice at pre the intervention, compared to the post telehealth nursing intervention, the good protective measures practice level was significantly improved (71.4%). **Conclusion:** Telenursing is an efficient approach for improving students' awareness and their practice about protective measures against COVID-19. **Recommendations:** Continuous awareness on enhancing COVID-19 protective measures via telehealth nursing throughout all academic institutions are needed.

Keywords: Awareness, COVID-19, Protective measures, Telenursing, University students

1. Introduction

Coronavirus disease 2019 (COVID-19) is a highly infectious illness, it is capable of infecting both humans. The majority of human coronavirus infections cause mild common cold-like symptoms, however some can lead to disastrous diseases such as Severe Acute Respiratory Syndrome and Middle East Respiratory Syndrome (World Health Organization, 2020a). The COVID-19 is more than a health concern; it is causing severe educational, social, economic, and

political difficulties in nations all over the world (WHO 2020b). Furthermore, the disease has a major impact on daily living, results in a socioeconomic disaster (Qualls et al., 2017)

The COVID-19 is extremely infectious disease, resulting in a high death rate and fast viral transmission around the world (Weiss and Murdoch 2020). Accordingly, the WHO has recognized the COVID-19 is a pandemic. A pandemic is defined as "an epidemic that spreads across a large geographic area and affects an

abnormally large proportion of the population” (WHO 2020a). Worldwide, there had been 259 502 031 confirmed cases of COVID-19 reported, with 5 183 003 deaths in May 25, 2021. Egypt is one of the five African nations with the highest number of 29 652 confirmed cases (WHO, 2021).

The most common way for COVID-19 virus to spread from person to person is by respiratory droplets released when infected person with virus cough, sneeze, breathe, or talk. Individuals who come into close contact (within one meter) with an infectious person are at risk of contracting COVID-19 if infectious particles enter their mouth, eyes or nose. Also, it can spread by touching an infected surface then touching one's mouth, nose, or eyes (WHO 2020c). The individual can still spread virus before experiencing symptoms as fever, cough, tiredness, loss of taste or smell, shortness of breath or difficulty breathing, muscle aches, chills, sore throat, runny nose, headache, chest pain, pink eye, nausea, vomiting, diarrhea and rash (CDC, 2021).

The majority of COVID-19 patients has mild to moderate symptoms and can recover without any special treatment. However, the disease can result in serious medical complications such as pneumonia and breathing difficulties, organ failure in multiple organs, heart problems, a severe lung condition, blood clots, acute kidney injury, and additional viral and bacterial infection. Anyone of any age can become seriously ill or die because of COVID-19, which can cause death in some people (Yesse et al., 2021).

Telehealth is a key tool in preventing and controlling COVID-19 outbreaks. It is defined as the use of health information exchanged between sites via electronic communication to improve a patient's health. It is one strategy for assisting people in communicating with other during the spread of the corona virus, which aids in the reduction of COVID-19 transmission. Telehealth has the potential to mobilize all aspects of healthcare potentials in order to reduce disease transmission, conduct people to the appropriate level of health care, ensure the safety of providing health services online, protect patients, clinicians, and the community from infection, and finally,

reduce the burden on healthcare providers and the health system (Harper et al., 2021).

The advancement of technology has the potential to alter practice of nursing. It can assist nurses in providing nursing care to patients, their families, and communities. Telenursing can be a viable alternative to the traditional face-to-face approach of providing nursing care. Telenursing is the use of technology to give nursing care and perform practice of nursing. There was also some evidence of telenursing usage in nursing care, and it was reported that it may be employed for counseling, education, monitoring, besides assessment of health-care results (Chaupis et al., 2017).

Students should be viewed as not only vulnerable groups, but also as extremely effective collaborators in COVID-19 prevention efforts. They can play an important role as educators and influencers among their colleagues and in their societies. Students should collaborate with health officials to help break the chain of infection by receiving appropriate education about the disease and how it is spread. By technological advancements, today's youth are more connected through technology, the internet, and websites. They will be critical in disseminating accurate information about COVID-19, as well as prevention, government preparation, and response efforts (Salem et al., 2021).

The best preventative approach now is to minimize being susceptible to the virus, as there is no vaccination or effective treatment to combat COVID-19 in all countries (Kucharski et al., 2020; Baloch et al., 2020). A variety of approaches have been suggested for infection prevention that may reduce the risk of exposure such as wearing face masks indoors and outdoors in crowded areas, covering nose and mouth with wrist or tissue when coughing and sneezing, besides hand washing with soap and water or a hand sanitizer involving at least 60% alcohol should be done on a regular basis., avoiding touching the face as well as maintaining social distance will help to decrease virus spread (Adhikari et al., 2020). Moreover, a vaccine can help to prevent getting the COVID-19 virus or keep the person from becoming seriously ill if having COVID-19 virus (Akalu et al., 2020).

Community health nurses may be the nameless heroes of the COVID-19 epidemic, working in communities to minimize disease transmission through preventative measures, education, as well as screening. In a pandemic, the role of community nurse is to provide information on COVID-19, and enhance community members' awareness about preventive measures practice (Kawasaki et al., 2021). As a result, university students' awareness and practice are essential in controlling the spread of the disease. Knowing the cause of the disease, signs/symptoms, and the available methods of prevention can facilitate the proactive application of preventive measures (Angelo et al., 2021).

1.1. Significance of the study

Corona virus-19 had extended with over 200 countries worldwide, with a fatality rate of around 5.7 percent (Baud et al., 2020). Egypt is one of most populated countries in Africa, with a population of over 100 million persons (Central Agency for Public Mobilization and Statistics, 2020). This large number of residents may pose a significant danger of disease transmission and mortality, particularly among those suffering from chronic conditions. Worldwide efforts were made to avoid the virus from spreading. These approaches require political activities from governments as well as individual attitudes and actions that are reliant on public awareness of the condition (Abdelhafiz et al., 2020).

Telehealth provides a variety of major advantages that can help with disaster response when biological or environmental threats are present (Priya, 2020). The quick adoption of telehealth kinds in several low- and middle-income countries has created new opportunities for spreading health information regarding COVID-19 (Botha et al., 2021).

Students groups are vulnerable, and the presence of a single case can result in pandemics among students. It's important to implement necessary preventive measures in this group to reduce such risk (Angelo et al. 2021). Students at a university constitute a unique group of the student population because of their major dependence on social media, greater live independently, although they lack life experience.

Their awareness and behaviors actions may have a significant effect on a pandemic spread. Consequently, increasing student awareness of COVID-19 and implementing effective preventative strategies is important in reducing the spread of COVID-19 (Keene Woods et al., 2021). Thus, the aim of this study is to examine effect of telehealth nursing intervention on COVID-19 protective measures awareness and practice among university students.

1.2. Theoretical and operational definition

Tele-health Nursing

It is theoretically defined as is the use of technology to provide nursing services through computers and mobile devices (CDC, 2021).

In this study, it is operationally defined as using telecommunications technology as computers and mobile devices to enhance students' information about COVID 19 and its protective measures at a distance using various applications as WhatsApp & Zoom.

1.3. Aim of the study

To examine the effect of telehealth nursing intervention on COVID-19 protective measures awareness and practice among university students.

1.4. Research hypotheses

1. Post implementation of telehealth nursing intervention, students' awareness about COVID- 19 and its preventive measures will be improved compared to pre intervention.
2. Post telehealth nursing intervention, students' protective measures practice about COVID- 19 will be improved compared to pre intervention.

2. Subjects and Method

2.1. Research design

This study employed a quasi-experimental research design one group (pre & post -test) to achieve the study aim.

2.2. Research setting

This research was carried out at non-medical faculties including the faculty of Commerce and the faculty of Law at Shebin Elkom City, Menoufia University, Egypt.

2.3. Subjects

A convenience sample comprising of 280 university students, aged 18 to 24, from both genders, was obtained using an online Google form. They approved to contribute in the study, haven't had COVID-19, have mobile phone and had access to the internet. In order to calculate the sample size required to examine the effect of telehealth nursing intervention on COVID-19 protective measures awareness and practice among university students. We utilized Epi website (Open Source Statistics for Public Health), with the following equation: $N = [DEFF * Np (1-p)] / [(d2/Z21-\alpha/2*(N-1) + p*(1-p)]$. We employed 95% confidence intervals, with a sample size of 280 university students who accepted to engage in the study, and given the telehealth nursing intervention and evaluated pre and post intervention (Sullivan et al., 2009).

2.4. Tools of the study: -

The following tools were employed to collect data from university students:

1. Self-Administered structured questionnaire:

- It was created by the researchers following a review of the relevant literature and consisted of the following:

A. Personal characteristics: - It involved student's name, age, sex, faculty type, and academic year besides residence place.

B. Students' awareness about COVID-19:

It was designed to examine student's awareness about COVID-19 and consisted of forty-four questions. Eight elements concerning COVID-19 nature, six items about transmission route, seven items regarding signs and symptoms, seven about groups vulnerable to infection, four about complication and twelve items about protective measures of COVID-19. The replies to each item are in the form of yes/no, don't know. Students who knew the correct answer got a two score, while those who did not know or gave an incorrect answer obtained a zero. The overall awareness score was 88 points. Moreover, students were asked about information sources regarding COVID-19, but this question not

included in scoring system. It involved various choices as social media, television, family as well as friends and healthcare workers and the reply of each choice yes or no.

The grading method for students' awareness about COVID-19 was divided into three categories: "good awareness" when the student attained > 75% of the overall score, "fair awareness" when the student attained 50-75 % besides "poor awareness" was considered when the student achieved < 50% of the overall score. The instrument's reliability was examined using a test-retest procedure with 10 participants two weeks apart, and a correlation coefficient (Cronbach's alpha) was determined between the two scores. The correlation coefficient was 0.89, indicating that the instrument is reliable.

2. Students' reported practice related protective measures against COVID-19:

It was adopted from WHO guidelines (WHO, 2020d) and employed by the researcher to assess protective measures practice about COVID-19 as reported by students. It included sixteen items such as washing hands with soap and water, wearing mask in crowded places, avoiding touching eyes, nose, mouth with infected hands, keeping distance not less than one meter between people, etc. The reply of items on a three-category likert scale: always, sometimes, and never. Each reply with always was two score, sometimes (one score), while never (zero score). The overall score of student's protective measure practice is thirty-two. The scoring system was classified into "good practice" when the student attained >70% of the total score, and "poor practice" was considered <70% of the overall score. Reliability of the instrument, the correlation coefficient was 0.84, which indicates that the tool is reliable.

2.5. Validity of the tools: -

Study tools were reviewed for content validity by a panel of three experts in the fields of community health nursing, community medicine, and medical and surgical nursing. Modifications were implemented in response to comments from the panel regarding the accuracy of the statements besides the relevance of the contents.

2.6. Ethical considerations: -

The study approval was obtained by ethical and scientific research committee at Faculty of Nursing, Menoufia University. Informed consent was gained from study students by submitting it to them through WhatsApp group, after they were informed regarding the study's purpose, procedures, and duration as well as online link in the first page of the questionnaire and students cannot begin the questionnaire unless they approve to participate in data collection for the present study. Students who want to participate in the study must fill out the consent form and click on "I agree to participate in the study". Students were informed that participation in the study was entirely optional, and that they might withdraw at any point prior to completing the questionnaire with no consequences. Furthermore, the student's personal information was kept private.

2.7. Pilot study:-

A pilot study on 10% of chosen university students was undertaken to test the feasibility, clarity, and objectivity of the study tools. The necessary changes were taken into account. The students of the pilot research are not included in study's final sample.

2.8. Field of the work & data collection: -

- The data for this study was acquired in the early months of the pandemic, starting in March and ending in September 2020.
- An official letter was taken from the Dean of faculty of nursing at Menoufia University to each Dean of the study settings to carry out the study. It included the purpose of the study and methods of data collection.
- When attaining approval and written informed consent from the Dean of the study settings to conduct the study. The researcher established official contact with the director of student affairs to obtain access to the social networking sites of students from chosen faculties during their academic years.
- We employed online platforms such as Google Forms, WhatsApp, and Messenger to recruit eligible participants because of the faculties was closed at the time of data collection. The participants were recruited

using a link distributed to university students through selected faculty WhatsApp groups.

- Data collection instruments questionnaires were created and implemented using Google Forms link, (http://docs.google.com/forms/d/e/1FALPQLsdqiwfyn6eD90_FvgjmniciqPTDflzwQfykt) and the generated link was sent to students through social networking site of selected faculties,
- Students who fill the questionnaire and fit to eligibility criteria were involved in the study. The average number of students of selected faculties was 136 students from faculty of Commerce and 144 students from faculty of Law.
- The average time that taken for completing questionnaires was about 15-20 minutes. The students filled the questionnaire and submit it to the researcher.
- The obtained data used as the baseline assessment (pre -test).
- Instructions intervention was developed by the researchers according to findings obtained from pre-test assessment that revealed low compliance of university students with hand hygiene practices, wearing mask, avoiding crowded places and avoiding touch eyes and nose with infected hands.
- Instructions intervention aimed to improve student's awareness and practice about protective measures regarding COVID 19.
- The researchers divided students who were taken from each college into groups; each group consisted of 25 students and the meeting was held on zoom program and explained all the instructions about COVID-19 into in two sessions on two consecutive days and the duration of each session lasting approximately 35-45 minutes.
- In the first session, involved Covid-19 nature, causes, signs & symptoms, mode of transmission, high-risk group, complication and its protective measures. Also, healthy nutritional habits to strength the immune system.
- In the second session, the researchers highlight the importance of protective measures practice against COVID-19 by using PowerPoint, videos and images. The researchers illustrated the right technique of hand washing, covering mouth and nose during coughing, avoiding touching eyes, the right technique of wearing

mask, the time of wearing it and how to get rid of it .

- At the last session, the researcher sent a soft copy of booklet to students as the guide about protective measures of corona virus infection. This booklet developed by the researcher after revising the related literature.
- At the end of intervention period (3 months) post -test was performed by using the same pretest questionnaire through google form link.

2.9. Statistical analysis:

Data was coded and transformed into specially designed form to be suitable for computer entry process. Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 22. Graphics were done using Excel program. Quantitative data as students' age in years were presented by mean (\bar{X}) and standard deviation (SD). Paired t test was used to compare all items related to knowledge aspects about COVID 19. Also, it was used in all items of reported practice regarding protective measures against COVID 19. Qualitative data were presented in the form of frequency distribution tables, number and percentage. It was analyzed by chi-square (χ^2) test. However, if an expected value of any cell in the table was less than 5, Fisher Exact test was used (if the table was 4 cells) , or Likelihood Ratio (LR) test (if the table was more than 4 cells). Level of significance was set as P value <0.05 for all significant tests.

3. Results

Table 1: shows the personal characteristics of the study sample. This table reveals that the average age of the students was 20.7 ± 1.8 years with half of them were females (50%), and 51.4% from law faculty while 48.8% from commerce faculty. More than one fourth (28.6%) from the first academic year, 25.4% from second year and about one fourth from the third academic year (24.6%), and more than half of them (62.9%) living in rural areas, whereas more than one third (37.1%) living in urban areas.

Figure 1: demonstrates students' total awareness level of COVID 19 pandemic at pre intervention. It shows that that at pre intervention, the majority of university students (82.2%) had poor awareness

of COVID 19 pandemic, and fair awareness represented 16.4 percent, whereas good awareness had only 1.4%.

Figure 2: illustrates students' information sources regarding COVID-19. It illustrates that social media was the most common source of information regarding COVID 19 (63.9%), followed by television (59.6%), newspapers and magazines (56.8%), friends and family (45%) and healthcare workers were the lowest information sources (25%).

Figure 3: clarifies students' total practice level for protective measures against COVID-19 at pre intervention. It shows that at pre intervention, about three quarters of university students (74.6%) had poor practice about COVID 19 protective measures while 25.4% had good practice.

Table 2: shows mean score of students' awareness aspects about COVID-19 pre and post telehealth nursing intervention. It shows that the overall mean scores for each awareness aspect about COVID 19 virus, including COVID 19 nature, modes of transmission, symptoms, vulnerable individuals, complications, and protective measures, were statistically significantly higher post the telehealth nursing intervention than pre-intervention for each aspect ($P < 0.001$ for each).

Figure 4: students' total awareness level about COVID-19 pre and post telehealth nursing intervention. It illustrates that at post telehealth intervention, there was highly significant improvement ($p < 0.001$) in the different awareness level. At pre intervention, 82.2% had poor awareness regarding COVID 19, fair awareness represent 16.4% and only 1.4% had good awareness compared to post telehealth nursing intervention, the good awareness level had highly significant improved (83.2%), fair awareness had 9.3% while poor awareness had 7.5%.

Table 3: reveals mean score of protective measures practice against COVID-19 as reported by students' pre and post telehealth nursing intervention. it shows that at post telehealth nursing intervention, there was highly significant improvement in mean score of each protective

measure practice item compared to pre intervention ($p < 0.001$). At post telehealth nursing intervention the highest mean score of practice was 1.92 ± 0.23 for “taking the precautions when dealing with infected people”, followed by “washing hands well with soap and water before touching the eyes and nose” (1.90 ± 0.52), then “washing hands with soap and water for 20 seconds continuously” (1.8 ± 0.45). The whole mean score of protective measures practice was increased from 20.47 ± 4.61 pre intervention to 26.57 ± 5.6 post intervention and the difference was high statistically ($P < 0.001$).

Figure 5: demonstrates students' total practice level for protective measures against COVID-19 pre and post telehealth nursing intervention. It illustrates that at post telehealth nursing intervention, there was a significant improvement in protective measures practice level ($p < 0.001$). At pre intervention, about three quarters of university students (74.6%) had poor practice about protective measures against COVID 19 and 25.4% good practice compared to post telehealth nursing intervention, the good practice level was highly significant (71.4%) and poor practice was 28.6%.

Table 4: reveals relation between the students' personal characteristics and their level of awareness about COVID 19 virus pre intervention. It shows a high statistically significant relation between the students' personal characteristics and pre intervention awareness level about COVID 19 virus. Most of the studied students (93%) who were 18- 21 years old had poor awareness level compared to 74.1% among those who were 22- 24 years old, and the difference was high statistically significant (< 0.001). Male students showed a higher percentage of poor awareness than female students, and the difference was significant statistically (85% versus 79.3%, $P = 0.004$). The

most of the studied sample who were in first year (90%) and second year (93%) had poor awareness level, compared to 51.7 % of students in fourth academic year, and the difference was significant statistically ($P < 0.001$). In relation to their residence, majority of the studied sample who live in rural area had poor awareness level (94.3%) compared to 61.5% among those who live in urban area ($P < 0.001$).

Table 5: Relation between the students' personal characteristics and their level of protective measures practice against COVID 19 pre intervention. it reveals that there was no statistically significant relation between the students' personal characteristics and their level of protective measures practice against COVID 19 virus ($p > 0.05$ for each, except year of education ($P < 0.006$) which shows that there was a significant relation between students' academic year and their practice level about protective measures against COVID 19 virus ($p < 0.006$). More than three fourths of the studied sample who were in second academic year and 77.5% in first academic year had poor practice level, compared to 62.3 % among students in third academic year and 70% in fourth academic year ($P < 0.006$). Although, 78.1 % of the studied sample who were 18 –21 years old had poor practice level, compared to 72.3 % among students in age group 22 -24 years , the difference was not significant statistically ($P > 0.05$). In relation to their gender, there was no statistical significant difference between male and female students regarding their protective measures practice level. The same pattern was observed in residence where students living in rural areas showed higher percentage of poor practice compared to those who live in urban areas (76% versus 73.9% respectively), however, this difference was not significant statistically ($P > 0.05$).

Table 1: Distribution of personal characteristics of the study sample (N = 280)

Personal characteristics	No.	%
Age (Years)		
18 –	114	40.7
22 – 24	166	59.3
Mean ± SD	20.7 ± 1.8 years	
Academic year :		
First	80	28.6
Second	71	25.4
Third	69	24.6
Fourth	60	21.4
Gender :		
Male	140	50.0
Female	140	50.0
Faculty name:		
Faculty of Commerce	136	48.6
Faculty of Law	144	51.4
Residence:		
Rural	176	62.9
Urban	104	37.1
Total	280	100

Figure 1: Students' total awareness level about COVID-19 at pre intervention

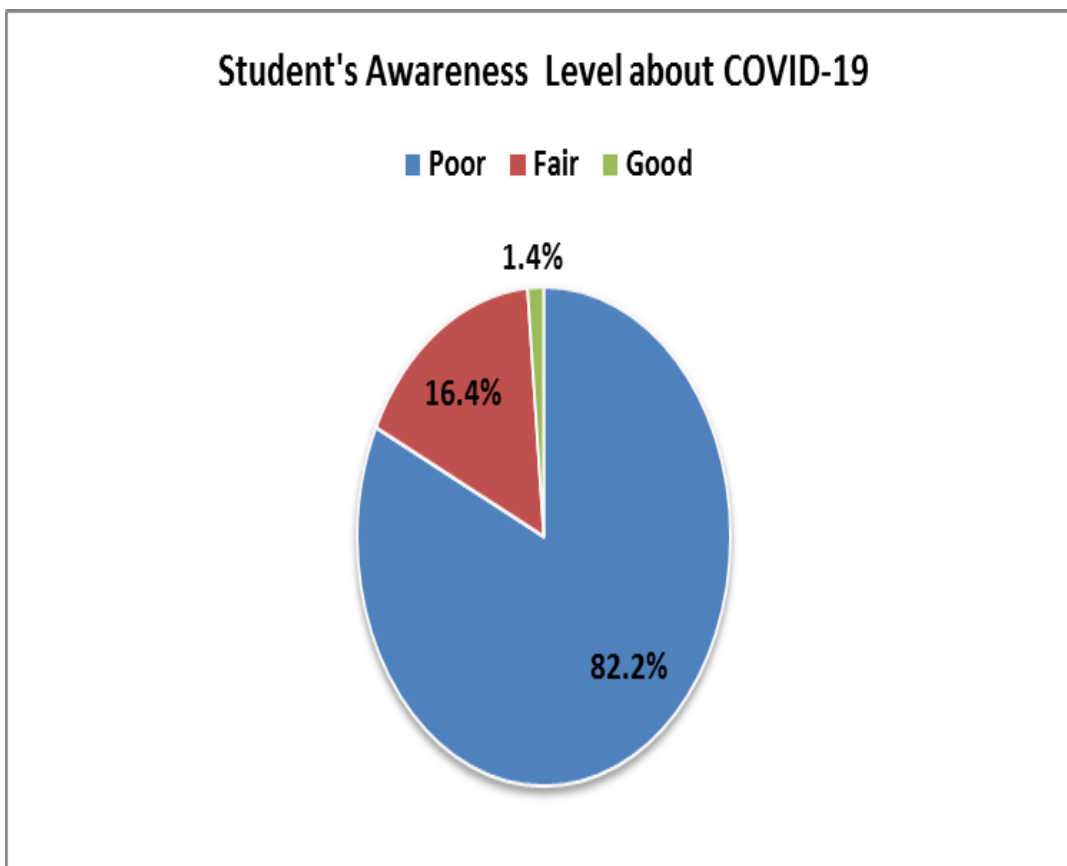


Figure 2: Students' information sources regarding COVID-19 (N=280)

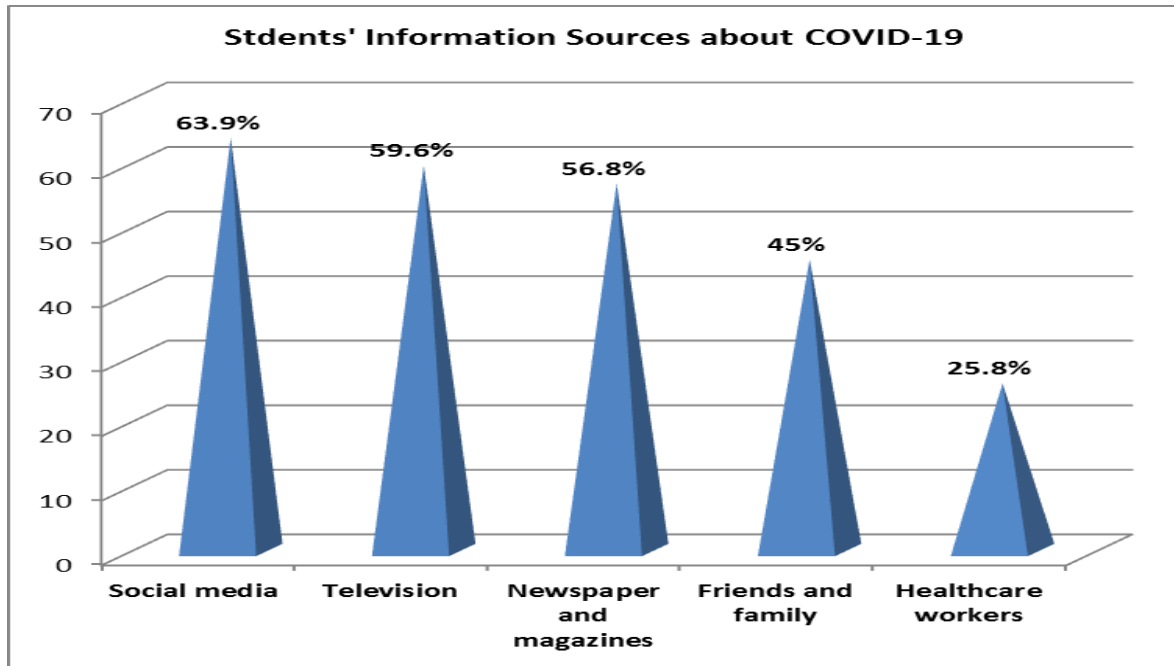


Figure 3: Students' total practice level for protective measures against COVID-19 at pre intervention

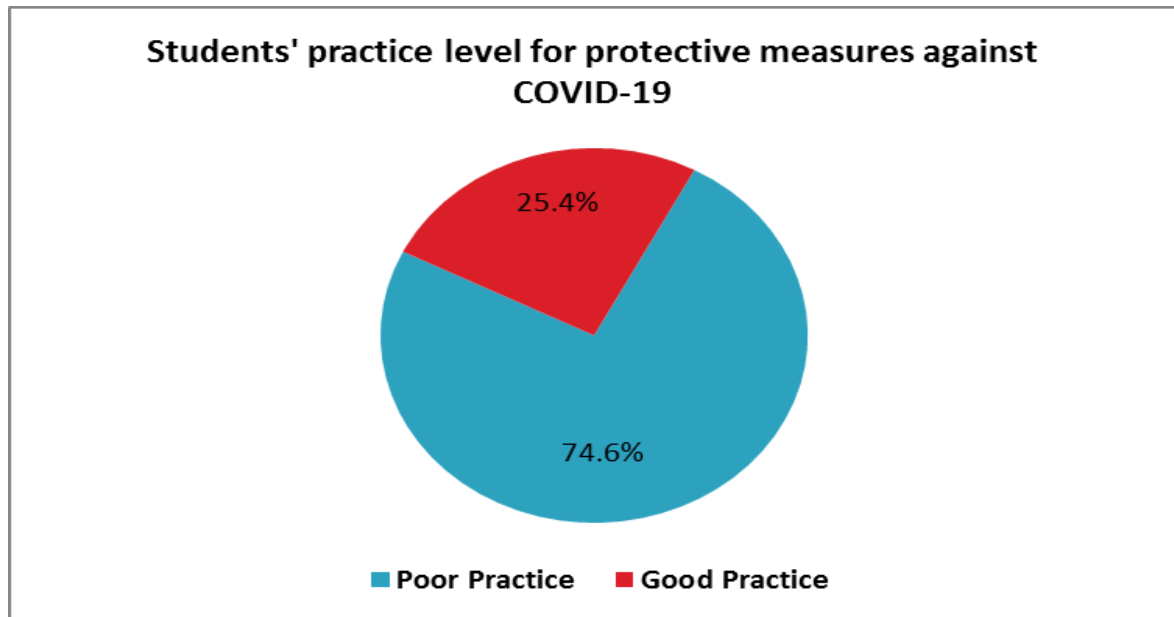


Table 2: Mean total score of students' awareness aspects about COVID-19 pre and post telehealth nursing intervention (N = 280)

Awareness aspects about COVID 19 virus	Pre intervention	Post intervention	Paired t test	P value
	Mean ± SD	Mean ± SD		
COVID 19 nature	5.37± 3.4	13.9 ± 0.51	41.53	<0.001*
Modes of transmission	3.71 ± 2.71	11.84 ± 0.62	48.88	<0.001*
Symptoms	4.76 ± 3.51	13.86 ± 0.58	42.82	<0.001*
Vulnerable people	4.71 ± 4.52	11.44 ± 1.21	24.06	<0.001*
Complication	2.46 ± 2.4	7.52 ± 1.02	32.56	<0.001*
Protective measures	8.02 ± 5.24	23.25 ± 1.56	27.9	<0.001*
Total awareness	29.73 ± 15.89	83.67 ± 2.83	55.89	<0.001*

*High significant

Figure 4: Distribution of students' total awareness level about COVID-19 pre and post telehealth nursing intervention (N = 280)

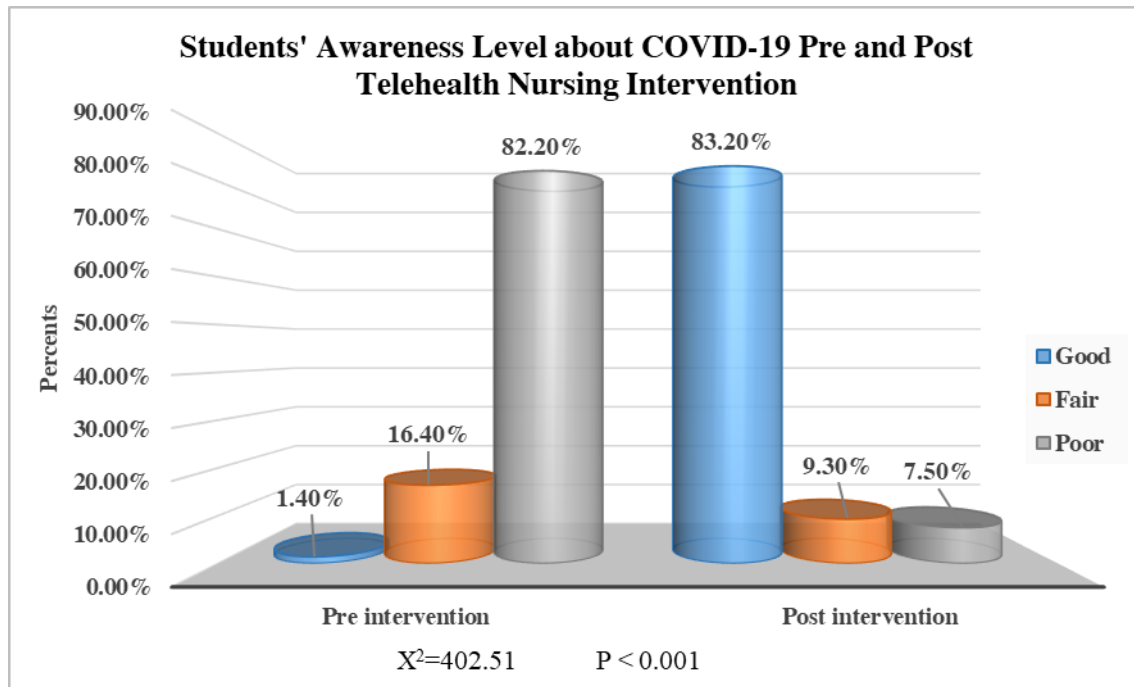


Table 3: Mean score of protective measures practice against COVID-19 as reported by students pre and post telehealth nursing intervention (N = 280)

Protective measures practice against COVID 19	Pre-test	Post-test	Paired t test	P value
	Mean \pm SD	Mean \pm SD		
Washing hands continuously with soap and water	0.92 \pm 0.51	1.8 \pm 0.45	19.4	<0.001*
Washing hands well with soap and water before touching eyes and nose	0.90 \pm 0.54	1.90 \pm 0.52	21.0	<0.001*
Washing hands well with soap and water after returning to home	0.88 \pm 0.16	1.7 \pm 0.53	30.5	<0.001*
Washing hands with soap and water after sneezing and coughing	0.82 \pm 0.21	1.6 \pm 0.42	31.8	<0.001*
Disinfecting hands regularly with an alcohol	0.80 \pm 0.30	1.5 \pm 0.70	31.3	<0.001*
Avoid contacting my eyes, nose, and mouth after coming into contact with contaminated objects	0.84 \pm 0.10	1.6 \pm 0.41	31.6	<0.001*
Covering the nose and mouth during sneezing	0.86 \pm 0.32	1.83 \pm 0.32	30.7	<0.001*
After using the tissue, dispose of it in the trash	0.90 \pm 0.51	1.47 \pm 0.31	30.9	<0.001*
Keep face away from the faces of others when sneezing	0.92 \pm 0.61	1.45 \pm 0.31	27.3	<0.001*
Wearing a mask everywhere outside the house	1.13 \pm 0.36	1.45 \pm 0.26	21.4	<0.001*
Wearing a mask in crowded places	0.97 \pm 0.22	1.45 \pm 0.22	26.9	<0.001*
Avoid dealing with infected people	0.91 \pm 0.52	1.79 \pm 0.15	31.6	<0.001*
Avoid touching infected surfaces without wearing gloves	0.87 \pm 0.32	1.48 \pm 0.63	32.3	<0.001*
Use disinfectants as chlorine after diluting it with water in cleaning the home	0.88 \pm 0.15	1.53 \pm 0.34	32.6	<0.001*
Take the precautions when dealing with infected people	0.82 \pm 0.33	1.92 \pm 0.23	36.4	<0.001*
Keep the distance not less than one meter in crowded places	0.84 \pm 0.32	1.25 \pm 0.50	11.3	<0.001*
Total mean score of protective measures practice	20.47 \pm 4.61	26.57\pm 5.6	28.4	<0.001*

*High significant

Figure 5: Distribution of students' total practice level for protective measures against COVID-19 pre and post telehealth nursing intervention (N = 280)

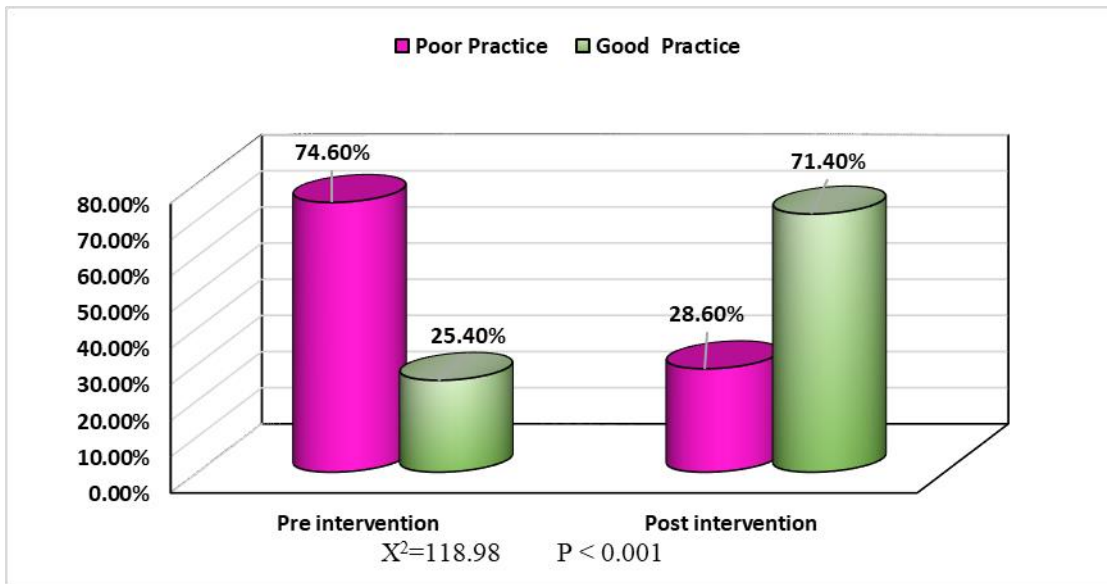


Table 4: Relation between the students personal characteristics and their level of awareness about COVID 19 virus pre intervention (N= 280)

Personal characteristics		Awareness level						Test of significance	
		Poor		Fair		Good		X ²	P-value
		No.	%	No.	%	No.	%		
Age (years)	18 - (N=114)	106	93.0	7	6.1	1	0.9	LR= 17.9	<0.001*
	22 – 24 (N=166)	124	74.7	39	23.5	3	1.80		
Gender	Male (N=140)	119	85.0	21	15.0	1	0.71	LR= 6.3	<0.004*
	Female (N=140)	111	79.2	25	17.9	3	2.14		
Academic year	First year (N=80)	72	90.0	6	7.5	2	2.5	LR= 46.3	<0.001*
	2 nd year (N=71)	66	93.0	5	7.0	0.0	0.0		
	3 rd year (N=69)	61	88.4	8	11.6	0.0	0.0		
	4 th year (N=60)	31	51.7	27	45.0	2	3.3		
Residence	Rural (N=176)	166	94.3	9	5.1	1	0.6	LR= 47.5	<0.001*
	Urban (N=104)	64	61.5	37	35.6	3	2.9		
Total	N=280	230	82.2	46	16.4	4	1.4		

LR (likelihood Ratio) * High significant

Table 5: Relation between the students' personal characteristics and their level of protective measures practice against COVID 19 pre intervention (N= 280)

LR (

Personal characteristics		practice level				Test of significance	
		Poor Practice		Good Practice			
		No.	%	No.	%	X ²	P-value
Age (years)	18 - (N=114)	89	78.1	25	21.9	1.2	0.27
	22 -24 (N=166)	120	72.3	46	27.7		
Gender	Male (N=140)	105	75.0	35	25.0	0.02	0.89
	Female (N=140)	104	74.3	36	25.7		
Education year	First year (N=80)	62	77.5	18	22.5	12.6	<0.006 *
	2 nd year (N=71)	62	87.3	9	12.7		
	3 rd year (N=69)	43	62.3	26	37.7		
	4 th year (N=60)	42	70.0	18	30.0		
Residence	Rural (N=176)	130	76.0	46	24	0.15	0.69
	Urban (N=104)	79	73.9	25	26.1		
Total	N=280	209	74.6	71	25.4		

likelihood Ratio)

*High significant

4. Discussion

The world nowadays is dealing with a highly contagious Coronavirus pandemic. To prevent COVID-19 from spreading among students, numerous preventive measures have been suggested. However, in order for these protective actions to be effective, students must have the necessary information. Therefore, students' awareness and practice to prevent and control the disease are essential. Nurses are part of health care teams that are accountable for supplying awareness, and safeguarding people from disease during the epidemic's peak phase (Ayed et al., 2021). Telehealth nursing can assist us in avoiding direct contact, reducing the likelihood of COVID-19 transmitting, and providing community-wide care. Telenursing is a subset of telehealth that concentrates on using telecommunications technologies to deliver, manage, and coordinate care and services within the nursing domain (Schlachta-Fairchild et al., 2021). Thus, the study aimed to evaluate the effect of telehealth nursing intervention on COVID-19

protective measures awareness and practice among university students.

In relation to students' total awareness level about COVID-19 at pre intervention, the current study results revealed that the majority of students had poor awareness of COVID 19 pandemic and its preventive measures. This results was in agreement with the findings of systematic analysis by Yazew et al., (2021) reported that awareness of COVID-19 prevention measures were insufficient to fight this spreading rapidly virus. The government, in cooperation with healthcare institutions, strongly recommends health promotion through public education regarding COVID-19 prevention measures. Everyone should follow the WHO and CDC guidelines to eliminate COVID-19. Likewise, Saxena et al., (2020) reported that about eighty one percent of non- medical undergraduate students' aged 18 to 25 years living in Uttarakhand were inadequate awareness about COVID-19. On the contrary, Al-Hanawi et al., (2020) they reported that majority of undergraduate students in the Kingdom of Saudi Arabia were knowledgeable

about COVID-19. On the other hand, Hussein et al., (2021) who implemented a study on medical students in Egypt, they showed that ninety four percentage of students had high level of knowledge. Also, Yesuf, & Abdu, (2022) performed study in Southwest Ethiopia and showed that most school students with mean age was 18.8 ± 1.30 years were good knowledge regarding COVID-19. The discrepancy might be owing to the sample's features as well as the fact that the current study was done at the onset of the viral epidemic, whereas other studies might possibly be attributable to the fact that the questionnaire was distributed during the COVID-19 pandemic and people may have received information and knowledge about the virus and its spread at the time through television, news, and media channels in order to safeguard themselves as well as their family.

The media has an important preventative effect by enhancing general public awareness about precautions (Abd El Fatah et al., 2020). The current data revealed that majority of students relied on social media as their main source of information regarding COVID 19, then television, and just one-quarter of studied students reported that healthcare workers were information source. This finding was similarly with other researches, which revealed that the social media and the internet were the most prevalent sources of COVID-19 information (Abd El Fatah et al., 2020; Hamaza et al, 2021; Nassar et al., 2021). The current research as well as a previous researches (Abd El Fatah et al., 2021; Salam et al., 2021) underline the importance of social media as a source of information. The enhancement of social media platforms' health systems and visibility through increased community information dissemination is very important (Prasad Singh et al., 2020).

Regarding to the effect of telehealth nursing intervention on the students' total awareness level regarding COVID-19, the current results illustrated that there were highly significant improvement noticed in the different level of students' awareness about COVID 19 after using telehealth nursing intervention. At pre intervention, more than three quarters of university students' had poor awareness about COVID 19 compared to post telehealth-nursing intervention; the good awareness level was highly significant improved to about eighty-three percent. This result supported the first hypothesis of the current study reported "awareness of university students who will

receive telehealth nursing intervention about corona virus infection will be improved at post intervention compared to pre intervention". This result similar to Nassar et al., (2021) who evaluated "effect of mobile-based nursing intervention on preventive measures of COVID –19 among children in Egypt". They reported that most of them had unsatisfactory knowledge in pre intervention compared to post-intervention. Also, Ayed et al., (2021) they evaluated "effect of educational intervention on students' knowledge, practices and attitudes regarding COVID-19 in Sohag City in Egypt ". They used online sources such as Google form in collecting questionnaire and used Whats App, Zoom programs in giving health education to students. They showed that all students had poor knowledge levels about COVID 19 at pretest while in the posttest, there was a highly significant improvement in students' knowledge regarding COVID-19 compared to pre- educational intervention.

Regarding students' total practice level for protective measures against COVID-19 at pre intervention, the current research illustrated that about three quarters of studied students had poor practice about COVID 19 protective measures while one quarter had good practice for preventive measures. This result was in line with Habib et al., (2021) who achieved a study in Northern Nigeria and found that only one fourth of subjects had good practice related protection from COVID-19. Moreover, Angelo et al., (2021) they showed that majority of college students in Mizan Tepi university had poor practice about performing preventive measures about COVID-19. Moreover, Kumar et al., (2021) assessed "knowledge, attitudes and practices towards COVID-19 guidelines among students in Bangladesh". They reported that most of students did not comply with COVID-19 rules very well. Additionally, Yesuf et al., (2022) who achieved a study in Southwest Ethiopia and concluded that although its high degree of students awareness, COVID-19 preventative strategies were rarely adopted.

On the contrary, these findings were inconsistent with Al-Hanawi et al., (2020) they reported that majority of undergraduate students at the Kingdom of Saudi Arabia had good compliance with protective measures practice against COVID-19. Also, Khasawneh et al., (2020) revealed that more than eighty percent of research medical students in Jordan implemented social isolation methods, washing hands regularly, and improved personal hygiene measures as

a main line of protection from the COVID-19 pandemic. This disparity between the current study and earlier researches could be explained by the fact that the current study was conducted at the COVID 19 peak period, where participants were unaware of COVID 19 protective measures. Besides variation may be related to criteria of the studied samples as well as cutoff point for estimating degree of practice.

Concerning to the effect of telehealth nursing intervention on protective measures practice against COVID 19 among university students, the present findings revealed a highly significant improvement in total protective measures practice level. At pre intervention, about three quarters of university students had poor practice about protective measures against COVID 19 and one quarter of students had good practice compared to post telehealth nursing intervention, the good practice level was highly significant improved. This result approved the second hypothesis of the current study, which stated "Protective measures practice of university students who will receive telehealth nursing intervention about COVID-19 will be improved post intervention compared to pre intervention. This result was in line with the findings by Ayed et al., (2021) revealed that at pre intervention, more than half of university students had poor practice about protective measures against COVID 19, one quarter of students had fair practice and only four percent had good practice compared to post telehealth nursing intervention, the good practice level was highly significant improved to hundred percent. Similar result via Hasan et al., (2021) they showed that non- medical students had poor practice level of protective measures than medical students in the United Arab Emirates.

The current study findings revealed that the total mean score of protective measures practice was increased from 20.47 ± 4.61 pre interventions to 26.57 ± 5.6 post intervention and the difference was statistically significant. At post telehealth nursing intervention, there were significant increase in mean score of each protective measure practice item as taking the precautions when dealing with infected people followed by washing hands well with soap and water before touching eyes and nose then washing hands with soap and water for 20 seconds continuously all the day compared to pre intervention. This result supported by Ayed et al., (2021) showed a significant

improvement in students practice about all the preventive measures from COVID -19.

The result from current study showed that the mean score for washing hands with soap and water for 20 seconds pre intervention was 0.92 ± 0.51 . This indicated that most of students never washing hands with soap and water for 20 seconds continuously. These results were in agreement with Hamza et al., (2021) they conducted a study among senior pharmacy students in Egypt and showed that most of students had low practice score of washing hands with soap and water. Additionally, these findings were in accordance with Adam et al., (2021) who reported that more than three quarters of students didn't practice hand hygiene.

Regarding to the relation between personal characteristics of students and their level of pre-intervention awareness about COVID-19, the current findings revealed a high statistical significant relation between the students' pre intervention awareness level about COVID 19 and personal characteristics as age, academic year & residence and gender. As regarding to gender, the present study findings revealed that male students had higher percentage of poor awareness than female students' and the difference was significant statistically. This result was in line with a cross-sectional study conducted in Iraq by Saeed et al., (2021) revealed that females had a significant higher understanding of COVID-19 precautionary measures. Similar researches in Malaysia by Azlan et al., (2020) as well as Al-Hanawi et al., (2020) in Saudi Arabia found that females knew more about COVID-19 than males. On the contrary, Abdelhafiz et al., (2020) in Egypt, and Adam et al ., (2021) in Kingdom of Saudi Arabia found that male and female participants had similar knowledge mean scores with no statistically significant difference. This difference may be attributed to variation in the studied sample criteria.

Concerning age, the current study revealed ninety-three percent of the studied sample who were 18-21 years old had poor awareness level compared to about three quarters among those who were 22-24 years old , and the difference was statistically significant. This finding was inconsistent with Adam et al., (2021) who performed a study among undergraduate students of applied medical sciences in Abha, Kingdom of Saudi Arabia and found that no statistically significant in age groups and knowledge

mean scores. This variation could be due to differences in the studied samples' characteristics.

In relation to students residence, the current study showed the majority of the studied sample who live in rural area had poor awareness level compared to among those who live in urban area This finding was in line with study conducted via Hatabu et al., (2020) who assessed ‘‘knowledge, attitudes, and practices toward COVID-19 among university students in Japan’’. They showed that students' living in a capital region is linked to having more knowledge than living in a non-capital region.

Regarding to the relation between personal characteristics of students and their level of protective measures practice against COVID 19 pre intervention, the current findings reported that there was no statistically significant relation between the students' personal characteristics and their level of protective measures practice against COVID 19 virus except year of education. This finding Similar with Adam et al ., (2021) the showed that age as well as sex of undergraduate students at Kingdom of Saudi Arabia had no significant difference concerning the practice. Likewise, Faisal et al., (2021) in Pakistan, revealed the same results. Moreover, Hussein et al., (2021) they concluded that gender, age and educational year, were not significantly correlated with subjects' COVID-19 preventive action.

The nurse plays a significant role in preventing the spread of the disease by encouraging the students to comply that is affected by the students' knowledge, attitudes, and practice regarding COVID-19 prevention efforts, as well as delivering health education on COVID-19 prevention and control. Evidence recommends that student awareness is critical in the management of pandemics (Angelo et al., 2021). The findings of systematic analysis reported that the government, in cooperation with healthcare institutions, strongly recommends health promotion through public education regarding COVID-19 prevention measures. Everyone should follow the WHO and CDC guidelines to eliminate COVID-19 (Yazew et al., 2021).

5. Conclusions

According to the results of this study, most of the university students in the study sample had poor awareness and practice about COVID 19

protective measures guidelines at pre intervention compared to post telehealth nursing intervention, there was a significant improvement in students' awareness level and mean score about COVID 19. Besides, students' level of practice and mean score of each protective measures regarding COVID 19 improved significantly after telehealth nursing intervention compared to pre intervention. Also, there was also a statistically significant relation between the students' pre intervention awareness level about COVID 19 and their personal attributes.

6. Recommendations:

Based on the findings of this study, we propose the following:

- Telehealth nursing intervention focused on increasing COVID-19 awareness are required, especially for vulnerable groups in order to improve their preventative behaviors.
- Continuous awareness on enhancing COVID-19 protective measures via telehealth nursing throughout all academic institutions are needed.
- Healthcare professionals are highly urged to use telehealth nursing strategies as a viable option for preventing and controlling COVID-19 pandemic.

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