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## Efficacy of Educational Nursing Interventions on Psychological Problems and Infection Prevention Practices Regarding COVID-19 among Critical Care Nurses

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### ABSTRACT

**Background:** Ensuring the mental well-being of critical care nurses is of utmost importance, as it directly impacts the uninterrupted provision of safe patient care and plays a vital role in effectively managing any potential outbreak. **Aim:** To evaluate the efficacy of educational nursing interventions on psychological problems and infection prevention practices regarding COVID-19 among critical care nurses. **Research design:** Quasi-experimental one-group pretest/posttest design was utilized. **Setting:** Intensive Care Units at 15<sup>th</sup> May Model Hospital & Helwan Fever Hospital. **Subject:** A convenience sample included 47 male and female nurses. **Tool I:** Coronavirus anxiety scale for nurses. **Tool II:** Coronavirus depression scale for nurses. **Tool III:** Nurses' infection prevention practices towards COVID-19 scale. **Results:** A statistically significant decrease in Anxiety Scores, Coronavirus depression Scores & increase in infection prevention practices toward COVID-19 scores after implementation of the educational nursing interventions. No significant change in anxiety, depression, or infection prevention practices scores at the follow-up phase. **Conclusion:** There was a statistically significant direct correlation between coronavirus anxiety scores and infection prevention practices toward COVID-19 scores before the implementation of educational nursing interventions. Respectively, there was no statistically significant correlation between coronavirus anxiety scores and coronavirus depression scores as well as coronavirus depression scores and infection prevention practices toward COVID-19 scores. **Recommendation:** Implementing regular and continuous educational programs for critical care nurses for addressing anxiety and depression related to the COVID-19 pandemic and providing guidance on best practices for infection prevention and control.

**Keywords:** COVID-19, Educational Nursing Interventions, Psychological Problems, Infection Prevention Practices, and Critical Care Nurses.

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## Introduction:

COVID-19, also known as the coronavirus 2019, is a severe respiratory illness that was initially discovered in Wuhan, China in December 2019. It is characterized by symptoms such as fever, dry cough, fatigue, muscle pain, and difficulty breathing. In the advanced stage of the illness, respiratory distress, septic shock, metabolic acidosis, bleeding, and coagulation dysfunction can occur (Chen et al., 2020). Recognizing the rapid global spread of COVID-19, the World Health Organization (WHO) declared it a worldwide pandemic on March 11, 2020 (Dao et al., 2021). As of June 2021, the disease has caused over 3.8 million deaths and has been confirmed in 170 million cases across 222 countries. The pandemic has also had an incalculable impact on healthcare professionals worldwide (Hadgson et al., 2021).

The World Health Organization has emphasized the urgent need to save lives and mitigate the adverse impact on the physical and mental well-being of nurses (WHO, 2020). The COVID-19 pandemic has put a significant strain on healthcare systems, with nursing staff being particularly affected (Armocida et al., 2020). Both frontline and non-frontline nurses face higher risks of infection and other detrimental physical health consequences, as demonstrated in previous viral outbreaks (Xiao et al., 2020). Critical care nurses have reported mental health issues such as post-traumatic stress disorder, burnout, depression, and anxiety symptoms, which can persist even years after the pandemic, potentially associated with their job experiences (Anwar et al., 2021). Despite grappling with their unique challenges, nurses are

entrusted with the responsibility of providing comprehensive care (Marinaci et al., 2020).

The alarming COVID-19 pandemic updates, including the staggering daily death toll and the increasing number of new cases, have taken a significant toll on critical care nurses. These nurses play a vital role in combating the outbreak of the coronavirus, making them indispensable resources for every nation (North et al., 2009). Managing coronavirus patients on a daily basis exposes critical care nurses to additional stressors such as irritability, anxiety, insomnia, fear, decreased productivity, and interpersonal difficulties (WHO, 2022). Prolonged exposure to these stressors can have adverse psychological effects on nurses, impacting their job performance and the quality of patient care they provide (Xiang et al., 2020). Consequently, prioritizing the health and well-being of nurses becomes crucial not only for the continuity and safety of patient care but also for the prevention of future outbreaks (National Health Commission of China, 2020).

Both critical care nurses with pre-existing mental health issues and those who are generally mentally healthy can experience heightened anxiety when faced with the unknown. The mental health effects of the Covid-19 pandemic have led to increased fear and uncertainty among individuals. In turn, distorted perceptions of risk and a sense of dread often drive harmful societal behaviors. These experiences can contribute to a wide range of public mental health challenges, including distress reactions (such as anger, insomnia, or fear of illness, even among those not directly exposed), engagement in health-risk

behaviors (such as social isolation or increased alcohol and tobacco use), the development of mental health disorders (such as anxiety disorders, post-traumatic stress disorder, or depression), and a decreased sense of overall well-being (**Hao et al., 2020**).

Critical care nurses are considered the heroes of the global pandemic, particularly those working in healthcare settings, who are confronted with exceptionally challenging responsibilities (**Shigemura et al., 2020**). As the primary point of contact with patients, nurses are not only exposed to significant infection risks but also can serve as a major source of transmission within healthcare settings. In response to this WHO and the Centers for Disease Control and Prevention (CDC) have issued guidelines for the prevention and control of COVID-19 specifically tailored to healthcare workers. The WHO has additionally implemented various online training sessions and provided educational materials in multiple languages to enhance preventive measures, raise awareness, and equip nurses with preparedness skills (**Bhagavathula et al., 2020**).

The key approach to containing and limiting the spread of the virus within healthcare settings is to adhere to preventive measures and follow established infection control protocols (**Abdelhafiz et al., 2020**). In order to prevent the transmission of the coronavirus infection, nurses should prioritize the implementation of stringent protective measures (**WHO, 2020**). However, challenges such as shortages of personal protective equipment (PPE), limited availability of COVID-19 testing, and imperfect infection control systems

(**Wang et al., 2020**) underscore the importance of safeguarding healthcare providers. This is crucial not only to ensure the continuity of healthcare services but also to prevent the transmission of the disease to other individuals (**Chang et al., 2020**).

The primary objective should be to implement an educational nursing intervention aimed at preventing the spread of COVID-19 infection and enhancing the psychological well-being of nurses. Additionally, considering that nurses play a vital role in providing health education to the community and supporting the professional development of other multidisciplinary team members (**WHO, 2020**), it is imperative that nurses themselves receive appropriate education (**Ministry of Health and Population Egypt, 2020**). Sustained educational interventions for nurses are crucial in order to uphold the delivery of high-quality, effective, and efficient nursing care. Such interventions have a significant impact, particularly during the COVID-19 pandemic, as they facilitate the transfer of clinical expertise from experienced nurses to expand the knowledge and practices of others (**Bao et al., 2020**).

#### **Significance of the study:**

The total number of confirmed COVID-19 cases worldwide stands at 154,098,279, with 3,224,709 reported deaths and 131,412,537 recovered cases. According to WHO, healthcare professionals account for approximately 14% of the global COVID-19 cases and up to 35% in certain regions. Egypt's Ministry of Health and Population reported the first COVID-19 infection

on February 14, 2020. As of October 2020, there were 750 documented cases and 56 deaths among healthcare professionals, specifically nurses (Lababidi et al., 2020). Additionally, the COVID-19 pandemic triggers a 25% increase in the prevalence of anxiety and depression globally.

Due to the close and frequent interactions of critical care nurses with patients, they have a crucial role in disease management and infection control. Consequently, nurses are susceptible to experiencing various psychological challenges and being at risk of infection themselves (Lababidi et al., 2020). Therefore, it is imperative to address their psychological well-being by addressing issues such as anxiety and depression. Furthermore, it is essential to enhance their knowledge and practices related to infection prevention and control, as well as strategies to limit the spread of COVID-19. This can be achieved through the implementation of educational interventions specifically designed for critical care nurses.

#### **Operational definition:**

Psychological problems in this study refer to anxiety and depression that may be experienced by critical care nurses as a result of confronting COVID-19 during giving care to such patients.

#### **Study Aim:**

The present study aimed to evaluate the efficacy of educational nursing interventions on psychological problems and infection prevention practices regarding COVID-19 among critical care nurses through:

- 1) Assess psychological problems regarding COVID-19 among critical care nurses pre-implementation of the educational nursing interventions.
- 2) Assess infection prevention practices regarding COVID-19 among critical care nurses pre-implementation of the educational nursing interventions.
- 3) Design educational nursing interventions for improving psychological problems and infection prevention practices regarding COVID-19 among critical care nurses.
- 4) Implement educational nursing interventions for improving psychological problems and infection prevention practices regarding COVID-19 among critical care nurses.
- 5) Evaluate psychological problems regarding COVID-19 among critical care nurses immediately post implementation of the educational nursing interventions, and post 3 months for follow-up.
- 6) Evaluate infection prevention practices regarding COVID-19 among critical care nurses immediately post implementation of the educational nursing interventions, and post 3 Months for follow-up.

#### **Research hypotheses:**

To fulfill the aim of the study, the following research hypotheses were formulated:

**H1:** Critical care nurses who receive educational nursing interventions while caring for COVID-19 patients will exhibit lower mean scores

of psychological problems (coronavirus anxiety & depression) in the posttest and follow-up assessments compared to their pretest scores.

**H2:** Critical care nurses who receive educational nursing interventions while caring for COVID-19 patients will demonstrate higher mean scores of infection prevention practices towards COVID-19 in the posttest and follow-up assessments compared to their pretest scores.

**H3:** There will be a positive correlation between the scores of psychological problems (coronavirus anxiety & depression) and infection prevention practices regarding COVID-19 among critical care nurses after the implementation of the educational nursing interventions.

## Subjects and Methods

### Research design:

A quasi-experimental one-group pretest/posttest design was utilized. A quasi-experimental design is a research method that allows for the establishment of a relationship between dependent and independent variables, resembling a cause-and-effect relationship (Thomas, 2022).

### Setting:

The research was conducted at the 15<sup>th</sup> May Model Hospital, specifically in the Intensive Care Unit and Cardiac Care unit, where each unit consists of 10 beds. Additionally, data was collected from the Intensive Care Unit located at Helwan Fever Hospital, which also has 10 beds. These settings were chosen because they have a significant number of COVID-19 patients, which

is relevant to the research topic. By selecting these specific healthcare settings, the study aimed to obtain insights into the experiences of critical care nurses in managing COVID-19 patients and addressing their psychological problems.

### Subjects:

A sample of convenience included 47 male and female critical care nurses from the aforementioned healthcare settings. For participation in this research study, nurses were required to meet certain inclusion criteria, including being in the age category of 20 and 60 years old, having provided care to COVID-19 patients in the intensive care unit, and having a minimum of 6 months of experience in the intensive care unit.

### Data Collection Tools:

**Tool (I): Coronavirus anxiety scale for nurses:** It was consisted of two parts.

#### Part I: Nurses' personal and professional characteristics:

It was developed by the researchers after reviewing the recent relevant literature. It was concerned with variables that were deemed important for understanding the personal and professional backgrounds of the participating nurses as; age, gender, residence, marital status, level of education, position, years of experience in the nursing field, years of experience in ICU and attendance of training courses related to COVID-19.

**Part II: Coronavirus anxiety scale (CAS):**

It was adapted from a study by Lee (2020) and subsequently translated into Arabic by the researchers for the current study. This scale was developed with the aim of assessing the levels of anxiety specifically related to the COVID-19 crisis. It consists of 5 items, and each item is rated on a 5-point Likert scale. The scale measures the frequency of anxiety symptoms experienced by participants over the preceding two weeks.

**Scoring system:** The 5-point Likert scale response options range from 0 (not at all) to 4 (nearly every day). To calculate the total score, the scores of each item were summed, resulting in a range of (0 to 20). A total score of 9 or higher indicates a probable presence of dysfunctional anxiety related to COVID-19.

**Tool (II): Coronavirus depression scale (CDS):**

This scale used in the study was adapted from a study by Divvi et al., (2021) and subsequently translated into Arabic by the researchers. The purpose of this scale was to assess levels of depression during pandemic outbreaks, specifically related to the COVID-19 pandemic. It consists of 10 items, and each item is rated on a 5-point Likert scale which ranges from strongly agree to strongly disagree. Participants indicated their agreement or disagreement with each statement. **Scoring system:** The 5-point Likert scale response options were scored from 1 (strongly agree) to 5 (strongly disagree). To calculate the total score, the scores of each item were summed, resulting in a range of (10 to 50). The highest score on the scale indicates a severe level of depression.

**Tool (III): Nurses' infection prevention practices toward COVID-19Scale:**

This scale used to assess the nurses' infection prevention practices towards COVID-19 was adapted from a study by Zhou, (2020) and translated into Arabic by the researchers. The main objective of this scale was to measure the extent to which individuals are engaged in infection prevention practices related to COVID-19. The scale consists of 17 items, and each item is rated on a 5-point Likert scale indicating frequency, ranging from never to always. Participants indicate the frequency at which they engage in each practice. **Scoring system:** The 5-point Likert scale response options were scored ranging from 0 (never) to 4 (always). To calculate the total score, the scores of each item were summed, resulting in a range of (0 to 68). The highest total score indicates a higher level of adherence to infection prevention practices.

**Validity and reliability:**

The tools used in the study were evaluated by a panel of five experts in critical care nursing and psychiatric mental health nursing specialties from Helwan University. The purpose of this evaluation was to ensure that the tools aligned with the study aim. Minor adjustments were made, including the translation of tools I, II, and III into Arabic. To assess the reliability of the adapted tools, Cronbach's Alpha test was conducted. The values obtained from CAS, CDS, and infection prevention practices on the COVID-19 scale were 0.752, 0.881, and 0.719, respectively.

**Pilot study**

A pilot study was conducted on Five nurses, which represented (10%) of the total number of nurses included in the study. The purpose of the pilot study was to evaluate the clarity and practicality of the proposed tools. These six nurses were also included in the chief studied nurses, as no modifications were necessary. The pilot study took place in February 2022.

**Ethical considerations:**

The research ethics committee of the Faculty of Nursing at Helwan University granted ethical approval with the code number (31-19/10/2022) for conducting the study. Then the official approvals from the respective hospital authorities were obtained. Prior to the study, informed consent was obtained verbally from the participating nurses, ensuring their understanding of the study's purpose, their rights to participate or withdraw, and the assurance of their data confidentiality.

**Fieldwork:****1. Preparation and assessment phase**

After conducting an extensive review of recent literature and theoretical knowledge relevant to the study, the researchers developed data collection tools and educational nursing interventions. These tools were designed to capture the necessary information and variables related to the study objectives. Before implementing the educational nursing interventions, a pilot study was conducted to assess the suitability and effectiveness of the data collection tools. During this pilot phase, the researchers tested the predetermined tools on a small group of

participants to ensure clarity and applicability. Following the successful pilot study, the researchers proceeded to distribute the questionnaires to collect baseline data using all the tools without providing any educational nursing interventions to the participants. This approach allowed for the assessment of participants' initial status and provided a basis for comparison with the data collected after the educational nursing interventions were implemented.

**2. Implementation phase:**

Data collection for the study took place over a period of six months, specifically from March to August 2022. The researchers were present at the study settings two days a week, from 9:00 am to 2:00 pm, to conduct the intervention sessions and collect data. The researchers classified the participants into two groups according to the two mentioned settings. Each nurse participating in the study received a total of 12 sessions, with two sessions conducted per week.

Each session had a duration of approximately 30 minutes, and there was a break period in between sessions. To ensure effective communication and understanding, the researchers used simple and clear language during the sessions. Additionally, visual aids such as pictures and videos were incorporated to enhance clarity and engagement for the nurses.

For the intervention sessions, the place where the teaching sessions were conducted was quiet, had proper lighting, ventilated well, had adequate spacing, and had chairs for the nurses' comfort.

The researchers utilized various media including, data show for displaying relevant materials. These tools and resources were employed to facilitate the educational interventions and ensure the effective delivery of the content to the nurses.

During the theoretical sessions, the researchers covered a wide range of topics related to COVID-19. These topics included the definition of COVID-19, its symptoms, the incubation period, modes of transmission, and preventive nursing practices. The sessions also covered terminology and concepts relevant to COVID-19, standards for home isolation, proper handling of patient waste, infection control procedures in the ICU, and procedures for the safe handling of deceased bodies. Additionally, the sessions addressed the psychological problems associated with COVID-19, specifically anxiety and depression, providing an understanding of their definition and impact.

In the practical parts of the sessions, the researchers focused on strategies to address the psychological problems of anxiety and depression. These strategies included techniques such as deep breathing, guided imagery, and muscle relaxation. The importance of maintaining a healthy diet and engaging in regular exercise was also emphasized. Furthermore, the sessions emphasized the importance of changing one's attitude toward the pandemic and adopting a positive mindset.

To support the nurses in implementing the training outside of the sessions, the researchers provided each nurse with a booklet. This booklet was developed in simple Arabic language and

contained detailed instructions for the training activities to be carried out. The booklet served as a reference guide for the nurses, ensuring they had the necessary information and guidance to follow during the implementation of the educational nursing interventions.

### **3. Evaluation phase:**

After the completion of the educational nursing interventions, the researchers conducted an evaluation to assess the effect of these interventions on the studied nurses. The evaluation process occurred on two occasions: once immediately post-interventions and another follow-up evaluation three months later. For this evaluation, the researchers utilized tools I, II, and III, which were previously described to measure the effect of the educational nursing interventions on these key variables. These tools were administered to all nurses to gather data regarding their anxiety levels, depression levels, and infection prevention practices toward COVID-19.

The first evaluation took place immediately after the completion of the interventions, allowing the researchers to assess the immediate effects of the educational interventions on the nurses' anxiety levels, depression levels, and infection prevention practices toward COVID-19.

The second evaluation occurred three months later, serving as a follow-up assessment to determine the sustainability and long-term effects of the interventions on the nurses' well-being and practices.



By conducting these evaluations at two different time points, the researchers were able to gain insights into the immediate and enduring effects of the educational nursing interventions, providing valuable information about the effectiveness of the interventions on the studied nurses.

### Statistical analysis:

The collected data were tabulated and analyzed using the IBM Statistical Package for the Social Sciences (SPSS) version 23. Qualitative data were presented as frequencies and percentages. All scores data showed non-normal (non-parametric) distribution. Data were presented as median, range, mean, and standard deviation (SD) values. Friedman's test was used to study the changes in different scores after the application of the program. Dunn's test was used for pair-wise comparisons when Friedman's test is significant. The Mann-Whitney U test was used for comparisons between the two groups. The Kruskal-Wallis test was used for comparisons between more than two groups. The significance level was set at  $P \leq 0.05$ . The results were also presented graphically to aid in visualizing the findings.

### Results

**Table 1**, shows that the present study was conducted on 47 nurses; 27 males (57.4%) and 20 females (42.6%). 93.6% of the studied nurses were aged 20>30 years old. 53.2% of the studied nurses were technical institute graduates while 29.8% of the studied nurses had Bachelor degree. 61.7% of the studied nurses were from rural areas and 57.4% of them were married. 65.95% of them were staff

nurses. 59.6% of the studied nurses had more than 5 years of experience in nursing and 57.4% of them had less than 5 years experience in ICU. 70.2% of the studied nurses had attended training courses about COVID-19.

**Table 2**, represents that there was a statistically significant change in CAS scores over time ( $P$ -value  $<0.001$ ). Pair-wise comparisons between the time periods revealed that there was a statistically significant decrease in CAS scores after the implementation of the educational nursing interventions followed by non-statistically significant change in CAS scores at follow-up. There was a statistically significant change in CDS scores over time ( $P$ -value  $<0.001$ ). Pair-wise comparisons between the time periods revealed that there was a statistically significant decrease in CDS scores after the implementation of the educational nursing interventions followed by non-statistically significant change in CDS scores at follow-up. There was a statistically significant change in infection prevention practices toward COVID-19 scores over time ( $P$ -value  $<0.001$ ). Pair-wise comparisons between the time periods revealed that there was a statistically significant increase in infection prevention practice toward COVID-19 scores after the implementation of the educational nursing interventions followed by a non-statistically significant change in infection prevention practice toward COVID-19 scores at follow-up.

**Table 3**, illustrates that there was no statistically significant association between personal characteristics and CAS scores before implementation of the educational nursing

interventions. While post implementation of the educational nursing interventions, there was no statistically significant association between personal characteristics and CAS scores except for two variables; Firstly, experience in nursing where nurses who have experienced less than 5 years showed statistically significantly lower CAS scores than those with an experience more than 5 years ( $P$ -value = 0.048). The second variable was attending COVID-19 training courses where nurses who attended training courses showed statistically significantly higher scores than those who didn't attend training courses ( $P$ -value = 0.043).

**Table 4**, reveals that there was no statistically significant association between personal and professional characteristics and CDS scores before the implementation of the educational nursing interventions except for two variables; firstly gender, where male nurses showed statistically significantly higher CDS scores than female nurses ( $P$ -value <0.001). The second variable was residence where nurses from urban areas showed statistically significantly lower scores than those from rural areas ( $P$ -value = 0.012). While post implementation of the educational nursing interventions, there was no statistically significant association between personal and professional characteristics and CDS scores except for attending COVID-19 training courses where nurses had training courses showed statistically significantly higher scores than those who didn't have training courses ( $P$ -value = 0.007).

**Table 5**, reveals that there was no statistically significant association between personal and professional characteristics and infection prevention practice regarding COVID-19 scores before the implementation of the educational interventions. While post-implementation of the educational nursing interventions as well as at follow-up, there was no statistically significant association between personal and professional characteristics and infection prevention practice regarding COVID-19 scores except for gender, where males showed statistically significantly lower scores than females ( $P$ -value = 0.029).

**Table 6**, indicates that there was a statistically significant direct correlation between CAS and infection prevention practice regarding COVID-19 scores before the implementation of the educational nursing interventions. An increase in CAS scores is associated with an increase in infection prevention practices regarding COVID-19 scores. Respectively, there was no statistically significant correlation between CAS and CDS as well as CDS and Practice scores. While post implementation of the educational nursing interventions as well as at follow-up, there was no statistically significant correlation between all scores.

**Figure 1**, shows that there was a statistically significant direct correlation between CAS and infection prevention practice regarding COVID-19 scores before implementation of the educational nursing interventions. An increase in CAS scores is associated with an increase in infection prevention practices regarding COVID-19 scores.

Table (1): Frequencies and Percentages Distribution for Personal and Professional Characteristics of the Studied Nurses (n = 47)

Personal Characteristics	The Studied Nurses	
	No	%
<b>Gender:</b>		
Male	27	57.4
Female	20	42.6
<b>Age/ Years:</b>		
20>30	44	93.6
30>40	1	2.1
40>50	2	4.3
<b>Qualifications:</b>		
Technical Institute of Nursing	25	53.2
Nursing School	1	2.1
Bachelor of Nursing	14	29.8
Post-graduate studies	7	14.9
<b>Residence:</b>		
Urban	18	38.3
Rural	29	61.7
<b>Marital status:</b>		
Married	27	57.4
Single	20	42.6
<b>Position:</b>		
Charge Nurse	2	4.25
Staff Nurse	31	65.95
Head Nurse	2	4.25
Nursing Supervisor	12	25.5
<b>Years of experience in the nursing field:</b>		
Less than 5 years	19	40.4
More than 5 years	28	59.6
<b>Years of experience in ICU:</b>		
Less than 5 years	27	57.4
More than 5 years	20	42.6
<b>Attending COVID-19 training courses:</b>		
Yes	33	70.2
No	14	29.8

Table (2): Mean Scores for Coronavirus Anxiety Scale, Coronavirus Depression Scale, and Infection Prevention Practices for the Studied Nurses Pre, Post, and Three Months Follow-up Post Implementation of Educational Nursing Interventions (n=47)

Variables	Pre		Post		Post 3 months Follow-up		P-value
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)	
CAS	1 (0-10) <sup>A</sup>	1.64 (2.18)	0 (0-1) <sup>B</sup>	0.02 (0.15)	0 (0-1) <sup>B</sup>	0.02 (0.15)	<0.001*
CDS	37 (33-40) <sup>A</sup>	36.62 (1.74)	28 (17-33) <sup>B</sup>	26.83 (3.19)	28 (17-33) <sup>B</sup>	26.83 (3.19)	<0.001*
Infection prevention Practices score	54 (43-65) <sup>B</sup>	53.98 (5.18)	58 (52-63) <sup>A</sup>	57.83 (2.9)	58 (52-63) <sup>A</sup>	57.83 (2.9)	<0.001*

\*: Significant at  $P \leq 0.05$ , Different superscripts indicate statistically significant change by the time

Table (3): Association between Personal and Professional Characteristics and Coronavirus Anxiety Scale Scores for the Studied Nurses Pre and Post Implementation of Educational Nursing Interventions (n=47)

Personal Characteristics	CAS Scores											
	Pre					P-value	Post					P-value
	Median	Minimum	Maximum	Mean	SD		Median	Minimum	Maximum	Mean	SD	
<b>Gender</b>												
Male	1	0	7	1.59	1.76	0.374	0	0	0	0	0	0.389
Female	0	0	10	1.7	2.7		0	0	1	0.04	0.19	
<b>Age/years</b>												
20>30	1	0	7	1.5	1.84	0.868	0	0	1	0.02	0.15	0.966
30>40	1	1	1	1	-		0	0	0	0	-	
40>50	5	0	10	5	7.07		0	0	0	0	0	
<b>Qualifications</b>												
Technical Institute of Nursing	0	0	6	1.16	1.55	0.283	0	0	1	0.04	0.2	0.830
Nursing School	0	0	0	0	-		0	0	0	0	0	
Bachelor of Nursing	1.5	0	10	2.64	3.03		0	0	0	0	0	
Post-graduate studies	1	0	5	1.57	1.81		0	0	0	0	0	
<b>Residence</b>												
Urban	1	0	10	1.78	2.58	0.873	0	0	1	0.06	0.24	0.204
Rural	1	0	7	1.55	1.94		0	0	0	0	0	
<b>Marital status</b>												
Married	1	0	10	1.63	2.37	0.857	0	0	1	0.04	0.19	0.389
Single	1	0	6	1.65	1.95		0	0	0	0	0	
<b>Position</b>												
Charge nurse	2	1	3	2	1.41	0.232	0	0	0	0	0	0.915
Staff nurse	0	0	7	1.26	1.79		0	0	1	0.03	0.18	
Head nurse	0.5	0	1	0.5	0.71		0	0	0	0	0	
Nursing Supervisor	1.5	0	10	2.75	2.99		0	0	0	0	0	
<b>Experience in nursing</b>												
Less than 5 years	0	0	1	0.05	0.23	0.225	0	0	4	0.79	1.08	0.048*
More than 5 years	0	0	0	0	0		1.5	0	10	2.21	2.54	
<b>Experience in ICU</b>												
Less than 5 years	1	0	7	1.19	1.62	0.228	0	0	1	0.04	0.19	0.389
More than 5 years	1.5	0	10	2.25	2.69		0	0	0	0	0	
Attending COVID-19 training courses												
Yes	0	0	0	0	0	0.125	1	0	10	2	2.36	0.043*
No	0	0	1	0.07	0.27		0	0	5	0.79	1.42	

\*: Significant at  $P \leq 0.05$

Table (4): Association between Personal and Professional Characteristics and Coronavirus Depression Scale Scores for the Studied Nurses Pre and Post Implementation of Educational Nursing Interventions (n=47)

Personal Characteristics	CDS Scores											
	Pre					P-value	Post					P-value
	Median	Minimum	Maximum	Mean	SD		Median	Minimum	Maximum	Mean	SD	
<b>Gender</b>												
Male	28	24	33	28.41	2.02	<0.001*	37	34	39	36.89	1.37	0.330
Female	24.5	17	30	24.7	3.26		36	33	40	36.25	2.12	
<b>Age/years</b>												
20>30	28	17	33	26.89	3.26	0.468	37	33	40	36.75	1.7	0.129
30>40	28	28	28	28	-		34	34	34	34	-	
40>50	25	24	26	25	1.41		35	34	36	35	1.41	
<b>Qualifications</b>												
Technical Institute of Nursing	28	17	31	26.68	3.26	0.700	37	33	40	36.92	1.61	0.292
Nursing School	24	24	24	24	-		36	36	36	36	-	
Bachelor of Nursing	27.5	19	33	27.29	3.54		37	33	39	36.71	1.86	
Post-graduate studies	28	24	30	26.86	2.48		36	33	38	35.43	1.81	
<b>Residence</b>												
Urban	25	17	30	25.33	3.33	0.012*	36	33	38	36.22	1.59	0.201
Rural	28	19	33	27.76	2.76		37	33	40	36.86	1.81	
<b>Marital status</b>												
Married	28	19	32	27.22	2.65	0.441	37	33	40	36.63	1.76	0.991
Single	27	17	33	26.3	3.8		36.5	33	39	36.6	1.76	
<b>Position</b>												
Charge nurse	29	28	30	29	1.41	0.690	35.5	35	36	35.5	0.71	0.665
Staff nurse	27	17	33	26.84	3.22		37	33	40	36.71	1.74	
Head nurse	26.5	24	29	26.5	3.54		36	34	38	36	2.83	
Nursing Supervisor	27	19	32	26.5	3.45		37	33	39	36.67	1.83	
<b>Experience in nursing</b>												
Less than 5 years	28	19	33	27.37	3.15	0.412	37	33	40	36.63	1.98	0.877
More than 5 years		27	17	31	26.46		3.21	36.5	33	39	36.61	
<b>Experience in ICU</b>												
Less than 5 years		17	33	26.41	3.65	0.366	37	33	40	36.41	1.93	0.424
More than 5 years		28	24	31	27.4		2.39	37	34	39	36.9	
<b>Attending COVID-19 training courses</b>												
Yes		28	17	33	27.03	0.398	37	33	40	37.06	1.62	0.007*
No		27	19	30	26.36		2.79	35.5	33	38	35.57	

\*: Significant at  $P \leq 0.05$

Table (5): Association between Personal and Professional Characteristics and Infection Prevention Practices Scores for the Studied Nurses Pre and Post Implementation of Educational Nursing Interventions (n=47)

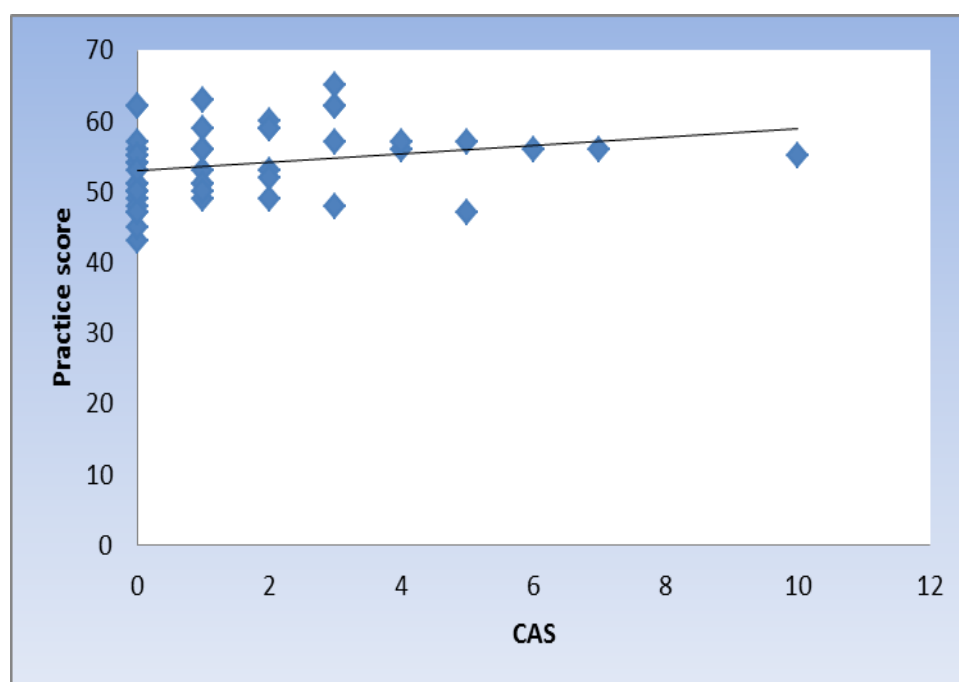
Personal characteristics	Infection Prevention Practice Scores											
	Pre					P-value	Post					P-value
	Median	Minimum	Maximum	Mean	SD		Median	Minimum	Maximum	Mean	SD	
<b>Gender</b>												
Male	53	43	63	53.26	5.09	0.376	57	52	62	57.07	2.13	0.029*
Female	55	47	65	54.95	5.28		59	52	63	58.85	3.5	
<b>Age/years</b>												
20>30	54.5	43	65	54.09	5.3	0.539	58	52	63	57.91	2.81	0.369
30>40	49	49	49	49	-		54	54	54	54	-	
40>50	54	53	55	54	1.41		58	54	62	58	5.66	
<b>Qualifications</b>												
Technical Institute of Nursing	52	43	65	53.44	5.91	0.642	58	52	63	58.12	2.74	0.426
Nursing School	53	53	53	53	-		54	54	54	54	-	
Bachelor of Nursing	54.5	47	59	53.93	3.63		57.5	52	62	57.29	2.73	
Post-graduate studies	57	49	63	56.14	5.55		58	54	63	58.43	3.78	
<b>Residence</b>												
Urban	51.5	47	62	53.17	4.48	0.302	57.5	52	63	57.72	3.18	0.783
Rural	56	43	65	54.48	5.59		58	52	63	57.9	2.77	
<b>Marital status</b>												
Married	55	47	65	54.59	4.44	0.332	58	53	63	57.7	2.57	0.812
Single	51.5	43	62	53.15	6.06		57.5	52	63	58	3.36	
<b>Position</b>												
Charge nurse	65.5	56	57	56.5	0.71	0.464	57	57	57	57	0	0.660
Staff nurse	53	43	65	53.42	5.61		57	52	63	57.81	2.98	
Head nurse	52.5	49	56	52.5	4.95		56	54	58	56	2.83	
Nursing Supervisor	56	47	63	55.25	4.47		58	52	63	58.33	3.03	
<b>Experience in nursing</b>												
Less than 5 years	53	43	63	53.68	5.02	0.862	57	52	63	57.37	3.13	0.348
More than 5 years	55	45	65	54.18	5.37		58	52	63	58.14	2.74	
<b>Experience in ICU</b>												
Less than 5 years <sup>27</sup>	54	43	63	54.19	5.31	0.650	57	52	63	57.59	3.05	0.630
More than 5 years	55	47	65	53.7	5.12		58	52	63	58.15	2.72	
<b>Attending COVID-19 training courses</b>												
Yes	55	45	65	54.45	5.03	0.299	58	52	63	58.24	2.91	0.140
No	52	43	62	52.86	5.56		57	52	63	56.86	2.74	

\*: Significant at  $P \leq 0.05$

**Table (6): Correlation between Coronavirus Anxiety Scores, Coronavirus Depression Scores, and Infection Prevention Practices Scores for the Studied Nurses Pre, Post and Three Months Follow up Post Implementation of Educational Nursing Interventions (n=47)**

Scores	Pre		Post		Post 3 Months Follow-up	
	<i>P</i>	<i>P-value</i>	<i>P</i>	<i>P-value</i>	<i>P</i>	<i>P-value</i>
CAS and CDS	-0.047	0.752	-0.077	0.605	-0.077	0.605
CAS and infection prevention Practices	0.358	0.013*	0.033	0.827	0.033	0.827
CDS and infection prevention Practices	-0.112	0.453	-0.006	0.970	-0.006	0.970

\*: Significant at  $P \leq 0.05$



**Figure (1): Scatter Diagram Representing Direct Correlation between Coronavirus Anxiety Scale and Infection Prevention Practices Scores**

## Discussion

The rapid spread of COVID-19 presents a severe risk to human health and has profound impacts on public health, global communication, and economic systems worldwide. Among healthcare providers, critical care nurses have a pivotal role in the control and prevention of infectious diseases. They are at the forefront, providing direct care to individuals affected by COVID-19 (Chen et al., 2020). Given this

context, educational nursing interventions for nurses are crucial in addressing their psychological challenges and enhancing their practices to deliver high-quality care to patients (Slater et al., 2018).

The present study clarified that; the majority of the studied nurses were males; also the majority of the studied nurses in the age group were between 20> and 30 years old. Furthermore, more than half of the studied nurses had more than five years of experience in the nursing field. This

finding might be due to a lot of males getting into the nursing field in the last decade and the fact that this age is the age of work and nurses who are older have administrative work. Regarding the years of experience, this finding might be due to the nurses who work in ICU should have the ability for psychosocial adaptation, protection, care, access to information, and deal with different working conditions. This result was incongruent with a study carried out by (**Abd ElAziz et al., 2021**) who studied "Effect of Nursing Educational Program on Nurses' Knowledge and Practices regarding Pandemic Covid-19 in Isolation Unit" and found that the majority of the nurses were females, more than 50% of the nurses included in the study were below the age of 24, and the most of them had experience in the nursing field less than five years.

The current study result clarified that; more than half of the studied nurses had Technical Institute of Nursing. This finding might be because after the Technical Institute of Nursing, nurses can work in hospitals after a short time of studying. This study was incongruent with (**Nemati et al., 2020**) who studied "Assessment of Iranian nurses' knowledge and anxiety toward COVID-19 during the current outbreak in Iran" and reported that more than half of the nurses had a bachelor's degree. This study was also disagreeing with (**Saadeh et al., 2021**) in the study "Knowledge, attitudes, and practices toward COVID-19 among 311 nurses in Lebanon" which highlighted that; the majority of nurses had a bachelor's degree.

The present study results reported that; more

than half of the studied nurses were married, staff nurses, from rural areas and had less than 5 years' experience in ICU. This finding might be due to most of them being in the age of marriage in Egypt and it is the concept of the Egyptian community and the preference to marry an employee with a steady income. Additionally, more than two-thirds of nurses had given a COVID-19 training course and this finding might be due to the availability of training courses during the COVID-19 pandemic, the desire to increase knowledge and improve practices to be protected from the transmitted infection and It is the direction of a health sector to deal with the pandemic. Regarding years of experience in ICU, the finding might be due to increasing the number of patients who are admitted to intensive care units, where the need for comprehensive care through large numbers of staff nurses regardless of the experience years in ICU. This study was congruent with (**El-Monshed et al., 2021**) who studied "Nurses' knowledge, concerns, perceived impact and preparedness toward COVID-19 pandemic: A cross-sectional survey" and reported that the majority of nurses were married, lived in rural areas; had less than 5 years work experience and the majority of them had been given training course about infection prevention before.

The present study revealed that; there was a statistically significant decrease in Coronavirus anxiety scores after the implementation of the educational nursing interventions followed by a non-statistically significant change in Coronavirus anxiety scores at follow-up. This finding might be



due to the greatest fear of health personnel during the pandemic is the possibility to infect others, specifically family members so, nurses are at a higher risk of anxiety before the program sessions that were focused on learning nurses to deal with anxiety through breathing exercise, muscle relaxation, eating healthy foods and making regular exercise and through follow up, not all people have a commitment to what they were learned. Additionally, there was a statistically significant decrease in COVID-19 depression scores after implementation of the educational nursing interventions followed by non-statistically significant change in COVID-19 depression scores at follow-up. This finding might be due to the prolonged exposure to the stressors that can have adverse psychological effects on nurses such as contact with COVID-19 patients for longer working hours and the possible fear of dying, insomnia, and interpersonal difficulties before the program sessions that were focused on learning nurses to deal with depression through a breathing exercise, muscle relaxation, eating healthy foods, changing attitude and making regular exercise and through follow up, not all people have a commitment to what they were learned.

This study is consistent with **(De Kock et al., 2021)** who studied "A rapid review of the impact of COVID-19 on the mental health of healthcare workers: implications for supporting psychological well-being" and concluded that nurses are at risk of significant psychological problems as a direct result of the COVID-19 pandemic such as symptoms of anxiety and depression. This study is

also consistent with **(Harfush et al., 2020)** who studied "the effect of resilience intervention on nurses' resilience and psychological problems during the COVID-19 pandemic" and clarified that there was a highly statistically significant difference between pre and after the program implementation regarding anxiety and depression. This study is also in agreement with **(Balakumar et al., 2020)** who studied "COVID-19: are frontline surgical staffs ready for this? " And reported that educational intervention alleviates psychological problems such as anxiety and depression.

The present study results clarified that there was a statistically significant increase in the infection prevention practice toward COVID-19 scores after the implementation of the educational nursing interventions followed by non-statistically significant change in the practices at follow-up. This finding might be due to the program helping in increasing knowledge about infection prevention practices regarding COVID-19 reflected in nurses' practices after the educational nursing interventions. The study is in accordance with **(Abd ElAziz et al., 2021)** who studied "Effect of Nursing Educational Program on Nurses' Knowledge and Practices regarding Pandemic Covid-19 in Isolation Unit" and found that the total score for nurses' practices level in pre-test and post-test showed statistically significant differences between nurses' practices after the educational program compared with practices before implementation of the educational program.

The current study reported that there was no

statistically significant association between personal characteristics and Coronavirus anxiety scores before the implementation of the educational nursing interventions. While post implementation of the educational interventions, there was no statistically significant association between personal characteristics and Coronavirus anxiety scores except for two variables; Firstly, experience in nursing where nurses who have experienced less than 5 years showed statistically significantly lower Coronavirus anxiety scores than those with an experience more than 5 years. The second variable was attending COVID-19 training courses where nurses who attended training courses showed statistically significantly higher scores than those who didn't attend training courses. This finding might be due to the years of experience may play a negative role in increasing anxiety toward dealing with COVID-19 (the nature of the disease, transmission, signs, and symptoms). Additionally, regarding attending training courses, this finding might be due to the most of the training courses were focused on the COVID-19 pandemic in the absence of psychological effects of the pandemic as anxiety.

The study is inconsistent with **(Baraka et al., 2021)** who studied "Predictors of critical care nurses' stress, anxiety, and depression in response to COVID-19 pandemic" and found that decreased years of ICU experience and the absence of training on infection control were significantly associated with high anxiety scores. Additionally, showed that there was a statistically significant association between personal characteristics and

Coronavirus anxiety scores while increased nurses' age and female gender were significantly associated with higher anxiety scores. The study also is in agreement with **(Labrague & Santos, 2020)** who studied "COVID-19 anxiety among front-line nurses: predictive role of organizational support, personal resilience, and social support" and revealed that the nurses had anxiety.

The current study clarified that there was no statistically significant association between personal characteristics and COVID-19 depression scores before implementation of the educational nursing interventions except for two variables; firstly gender, where male nurses showed statistically significantly higher COVID-19 depression scores than female nurses. This finding might be due to the increased numbers of males than females in the study. The second variable was residence where nurses from urban areas showed statistically significantly lower scores than those from rural areas. This finding might be due to the long time of residence in cities that make them able to cope with different situations that are considered threatening. While post implementation of the educational nursing interventions, there was no statistically significant association between personal characteristics and COVID-19 depression scores except for attending COVID-19 training courses where nurses had training courses showed statistically significantly higher scores than those who didn't have training courses. This finding might be due to the most of the training courses were focused on the COVID-19 pandemic in the absence of psychological effects of the pandemic as depression.

The study is also inconsistent with (Baraka et al., 2021) who studied "Predictors of critical care nurses' stress, anxiety, and depression in response to COVID-19 pandemic" and found that female gender and married nurses were significantly associated with higher depression scores. Moreover, the study is consistent and reported that increased educational attainment for the courses was significantly associated with higher depression scores. The study also disagrees with (Lai et al., 2020) in the study "Factors associated with mental health outcomes among health care workers exposed to Coronavirus disease" and discovered that female technical nurses who contact with COVID-19 patients were at risk factors for severe depression. This was also in line with the findings of (Zhu et al., 2020) who studied " COVID-19 in Wuhan: immediate psychological impact on 5062 health workers" and revealed that more than 10 years of experience as nurses was another risk factor for depression.

The present study revealed that there was no statistically significant association between personal characteristics and infection prevention practice toward COVID-19 scores before the implementation of educational nursing interventions. While post implementation of the educational nursing interventions as well as at follow-up, there was no statistically significant association between personal characteristics and infection prevention practice toward COVID-19 scores except for gender where males showed statistically significantly lower scores than females. This finding might be due to females may

have adherence to rules and standards. This study was disagreeing with (Amro et al., 2022) who studied "Knowledge, Attitude, and Practices Concerning Covid-19 Preventive Measures among HealthCare Providers in Jordan" and reported that COVID-19 practices were significantly associated with receiving training programs on infection control. This outcome is also in line with (Abbas et al., 2020) who studied "A web-based health education module and its impact on the preventive practices of healthcare providers during the COVID-19 pandemic" and demonstrated the critical role of training healthcare providers to decrease the spread of COVID-19 infection.

The current study clarified that there was a statistically significant direct correlation between Coronavirus anxiety scores and infection prevention practice toward COVID-19 scores before the implementation of the educational nursing interventions. An increase in Coronavirus anxiety scores is associated with an increase in infection prevention practices toward COVID-19 scores. This finding might be due to the nature of the cases and workloads that may increase anxiety among the studied sample. Respectively, there was no statistically significant correlation between Coronavirus anxiety scores and COVID-19 depression scores as well as COVID-19 depression scores and infection prevention practice toward COVID-19 scores. While post implementation of the educational nursing interventions as well as at follow-up, there was no statistically significant correlation between all scores. This finding might be because this wasn't a peak time for the disease

and the number of cases became less. The study is in accordance with (Yin & Zeng, 2019) who studied "A study on the psychological needs of nurses caring for patients with coronavirus disease" and reported that practices of nurses toward infectious diseases such as COVID-19 were protective factors against psychological problems such as depression.

### Conclusion

Based on the study results, it was concluded that there was a statistically significant direct correlation between Coronavirus anxiety scores and infection prevention practices regarding COVID-19 scores before the implementation of the educational nursing interventions. Furthermore, an increase in Coronavirus anxiety scores is associated with an increase in infection prevention practices regarding COVID-19 scores. Respectively, there was no statistically significant correlation between Coronavirus anxiety scores and COVID-19 depression scores as well as COVID-19 depression scores and infection prevention practices regarding COVID-19 scores.

### Recommendations

Based on the study findings, the following recommendations were proposed.

1- Implementing regular and continuous educational programs for critical care nurses for addressing anxiety and depression related to the COVID-19 pandemic and providing guidance on best practices for infection prevention and control.

- 2- Enhance support for early-career nurses through providing opportunities for skill development and knowledge enhancement and creating a supportive work environment to promote their professional growth and well-being.
- 3- Strengthen infection prevention practices through regular training sessions, updates on the latest guidelines and protocols, and ensuring the availability of necessary personal protective equipment (PPE) and resources.

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