

Effect of an Educational Program on Nurses Performance Regarding COVID-19 in the Obstetrics and Surgical units

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ABSTRACT

COVID-19 a highly infectious disease threatened the world and created a big challenge to healthcare systems and their personnel worldwide. Nurse plays very important role in infection prevention and control, safeguard the community and providing care at this critical time. **Aim of this study** is evaluate the effect of an education program on nurses' performance regarding COVID-19. **Design:** A quasi-experimental design was used. **Setting:** this study was conducted in surgical and obstetric units at Beni-Suef University Hospital. **Sample:** all nurses (n = 40) working at surgical and obstetric units. **Tools:** Two tools were used a self-administered questionnaire to assess knowledge and observational checklist to assess practice. **Results:** preprogram; the majority of the nurses had unsatisfactory knowledge and practice regarding COVID-19 (87.5% and 90% respectively). A significant improvement was found immediately post-program (90% and 92.5% respectively) while this improvement lowered lightly post three months at follow up (77.5% and 80% respectively). **Conclusion:** A statistically significant improvement in nurses' performance had got after implementation of the program which confirming the study hypothesis. **Recommendation** that the necessary of continuous in-service training programs about COVID-19.

Key word: COVID-19, knowledge, practices.

Introduction

Coronavirus disease (COVID-19) is a pandemic disease caused by a new strain coronavirus. This was unknown before the outbreak in Wuhan, China, in December 2019. (*Abd ELAziz, et al., 2021*).

Coronaviruses are a group of microorganisms belonging to the Coronaviridae family. coronavirus infections can cause mild common cold-like symptoms and others may cause severe illnesses like acute

respiratory syndrome and Middle East Respiratory Syndrome. (*Who, 2019*).

COVID-19 has a highly infectious, and droplet transmission and contact (*Martin & Bowden, 2020*). It is spreads quickly, affecting of populations simultaneously throughout the world. The spread of the virus has been referred to as a pandemic, due to medical services are overwhelmed. Economies are closing down. The number of deaths is on rise and lives

have been disrupted. Scientists around the globe are looking for ways to treat the virus. (*Keogh and Weaver, 2021*).

COVID-19 has created a big challenge to healthcare systems and their personnel worldwide. Healthcare workers are a key element in managing this Covid-19 pandemic. The studies showed that the individual and places at greatest risk to implement modalities to enhance healthcare workers safety in future outbreaks. (*Garralda, et al., 2021*).

The current coronavirus pandemic, it is clear that COVID-19 is the agent that causes injury. The danger of harmful is greater in healthcare workers compared with the general population. (*Cook et al. 2020*).

The inadequate knowledge and the incorrect attitudes among healthcare workers can directly impact on practices and can lead to delayed diagnosis, and spread of disease (*Abdel Wahed, et al., 2020*).

Health care workers are exposed to the risk of infection during the epidemic chain is an inevitable situation due to their role in confronting the spread of disease. Therefore, it is important to promote healthcare providers and supply them with all possible measures to halt the spread of infection for them, first by evaluating the risk factors related to the disease and appropriate measures to reduce these risks, especially in low and middle-income countries whose resources are limited by the small number of healthcare providers in

many healthcare places. For this, it is necessary to provide (*Zhang et al., 2020; Hassan et al., 2020*).

COVID-19 infection puts other healthcare workers and the general community at risk of contracting the emerging virus. Reducing the exposure of health care workers to the risk of infection with COVID-19 is the best solution. This is best done through the health care personnel commitment to infection prevention control protocols (*Matrajt et al., 2021*).

The fact that healthcare workers are at hazard of infection in the epidemic chain is a crucial problem because HCWs help in controlling the outbreak. Therefore, all possible measures must be taken to hold the spread of the infection to HCWs, initially by recognize the risk factors for infection and then by taking appropriate measures to reduce these risks. awareness of infection prevention practices and knowledge about a disease. (*National Health Commission, 2020; Sheha et al., 2021*).

Nurses are the first line of contact with patients and a major source of infection in health-care settings; as a result, nurses are assumed to be at a high risk of infection. The WHO and CDC published COVID-19 prevention and control recommendations for HCWs in a variety of languages to help boost preventive measure, such as raising awareness and training nurses. (*Bhagavathula, et al., 2020*).

World Health Organization recommended the importance of nursing staff development programs to enhance nurses' Knowledge and practical achievement and their attitudes toward covid-19 in all health settings. (*WHO's Health Security and Environment Cluster, 2020*).

Therefore, staff educational programs regarding infection prevention and control in the obstetrics and surgical units are essential for preventing COVID-19 infections among healthcare workers and patients

Significance of the study:-

The fight against coronavirus disease remains continuous in Egypt and in the world. Until now, there are more than 567 million confirmed cases and over 6.3 million deaths have been reported in world (*WHO, 2022*). And there have been 514,891 confirmed cases of COVID-19 with 24,775 deaths in Egypt, on July 2022, (*Ministry of Health and Population in Egypt*). the prevention and control of this disease are the major challenges that every country faces.

Nurse plays important role in infection prevention, infection control, safeguard the community and providing care at this critical time, Worryingly, it is obvious that many of these nurses and healthcare personnel are not only combat the virus, they are also fighting the humanitarian crisis and putting their own lives on the line. (*Smith, et al., 2020, Elgendy, et al., 2018; Hassan et al., 2020*).

Maternity and surgical nurses play a crucial role in the quality of care and infection control improvement, which provides patients in obstetrics and surgical unit's education and support. At the same time, these specialized nurses can provide health promotion & psychosocial services include assessment, health education, counseling & appropriate referral (*Farg, et al., 2019; Mostafa, et al., 2018*).

Continuous training program is very important to eliminate the fear of the virus particularly in low and middle-income-settings. (*Costa et al., 2021; Hassan, et al., 2020; Sheha, et al., 2021*).

Therefore, it is essential to developing implementing educational program for nurses for enhancing their knowledge and practice about COVID 19 and must follow standard precautions when caring for patients.

Aim of the study:

The current study is conducted to evaluate the effect of an education program on nurses' performance regarding covid 19. This aim will be achieved through:

- 1- Assess nurse's knowledge regarding covid 19.
- 2- Assess nurse's practice regarding covid 19.
- 3- Evaluate the effect of training program on nurses' knowledge and practice.

Research Hypothesis:

H1: nurses' knowledge regarding covid 19 will be improved post-

educational-program-implementation and after three months later than pre-educational program implementation.

H2: nurses' practice regarding covid 19 will be improved post-educational-program-implementation and after three months later than pre-educational program implementation

H3: Positive correlation existed between nurses' knowledge and practice scores after the application of the educational program.

Subjects and Methods

Research Design:

A quasi-experimental design was used in this study.

Setting:

The study was conducted in surgical this unit has 35 beds for female, 26 beds for male and obstetric unit has 24 beds at Beni-Suef University hospital.

A. Subject:

All convenient samples included 40 nurses working in surgical and obstetric units at Beni-Suef University Hospital. Twelve nurses from the obstetric unit, fifteen nurses from surgical female unit and thirteen nurses from surgical male unit who agreed to participate in this study.

Tools of data collection:

Two tools were constructed and tested by the researcher to collect data pertinent to this study, these tools are:-

A self administered questionnaire sheet::

It was used to assess nurses' level of knowledge regarding covid 19. It was developed by the researchers

based on review of related literature from (*Al-Hanawi et al., 2020, Zhou et al., 2020, Rathnayake et al., 2021 and Mohamed, 2021*). It comprised Arabic structured items related to different aspects of assessment knowledge about covid 19. It was including two parts:

❖ Part one:

It concerned with demographic characteristics of the nurses involved in the study (age, gender, marital status, level of education and years of experience.

❖ Part two:

It concerned with assessment knowledge regarding the following issues:

- 1- General information about covid 19 (6 questions) (6 grades).
- 2- Mode of transmission of covid 19 (3 questions) (3 grades)
- 3- Signs and symptoms of covid 19 (4questions) (4 grades).
- 4- Diagnostic test of covid 19 (6 questions) (6 grades).
- 5- Therapeutic treatment of covid 19 (5 questions) (5 grades).
- 6- Complication of covid 19 (3questions) (3 grades).
- 7- Prevention of covid 19 (10 questions) (10 grades).

Scoring system:

All knowledge variables were closed ended questions. The total numbers were 37 questions; they were scored as the following.

- Each correct answer was given one grade
- The incorrect answer was given zero.

Total knowledge score was classified as the following:

- $\geq 75\%$ satisfactory
- $< 75\%$ unsatisfactory

Observational checklist for nurse practice regarding covid 19:

It was developed by the researchers based on reviewing the related literature (*Guidelines Library: Infection Control, Center of Disease Control and Prevention (CDC); 2019, Alzoubi et al., 2020, Nebraska Medicine, 2020 and Hassanc et al., 2020*). It was used to assess nurses' practices regarding covid 19.

It concerned with assess nurses' practices personal protective measure practice include the following

1. Hand washing (11 grades)
2. Personnel protective equipment (12 grades)
3. Well handling sharp instrument and proper disposal (10 grades)

Scoring system:

- Complete correct done was assigned a score of (2)
- Incomplete correct done was assigned a score of (1)
- Not done was assigned a score of (0)

Total practice score was $33 \times 2 = 66$

Total score of practice was classified into:

- $\geq 75\%$ satisfactory practice level.

- $< 75\%$ unsatisfactory practice level.

Educational booklet:

It was designed in Arabic language by researchers based on the results obtained from assessment of the nurses' knowledge and practice. which included general information about covid 19 such as (definition causes, etiology, high risk person incubation period), mode of transmission, signs and symptoms, diagnostic test, therapeutic treatment, complication and prevention of covid 19 The content was developed by the researchers after reviewing the related literature

Administrative and Ethical consideration:

1. Approval was obtained from the director of Beni-Suef university hospital to obtain permission for collection of data.
2. The aim and purpose of the study was clarifying by the researchers to the studied nurses.
3. The researchers informed the subject's their rights to take part or withdraw from the study at any time without any rational and they were assured that their data would be confidential for the cause of this research.

Tools validity and reliability:

• Content validity:

The tools were revised for content validity by a group of seven experts of Medical-Surgical Nursing Specialties. The experts reviewed the tool for accuracy, clarity, relevance and comprehensiveness, minor modification was done.

• The reliability:

Reliability of the tool was tested by using alpha Cronbach's test ($r=0.936, 0.958$)

- **Pilot study:**

It was carried out on ten percent of the total study. This was done to test applicability, clarity and efficiency of the tools. minor modification was done, so the nurses who shared in the pilot study were excluded from the sample.

Field work:

Data were collected from the beginning November 2021 to the end of July 2022. The program was implemented for nurses working in surgical and obstetric units at Beni-Suef University Hospital. The data were included the following phases:

- Assessment phase.
- Planning and implementation phase.
- Evaluation phase.

Program phase:**1. Preparatory phase:**

It was included reviewing of literature and theoretical knowledge of numerous aspects of the study use books, articles, internet, periodicals and magazines to developing tools for data collection and the training program for nurses.

The program implementation schedule was designed through the researchers. Goals, learning activity, teaching methods and media were prepared. The content of the training program was divided into 8 sessions; the period of each session is one hours.

Permission for data collection and implementation of the study in Beni-Suef University hospital was obtained

from the hospital director through the submission of a proper letter from the faculty of nursing, Beni-Suef University. Meeting and discussions had been held through the researchers and nurses to provide an explanation about the aim and the character of the study and take their approval to participate in the study before any data collection.

Program assessment:

The researchers were assessing of nurse's knowledge and practice about covid 19 at Beni-Suef University Hospital by used questionnaire sheet and observational checklist. The researchers were attended to the units three days per week in the morning shift.

- 1) As regards to the observational checklist the evaluation was done firstly to assess of nurse's practice regarding covid 19.
- 2) As regards to the questionnaire sheet was carried to assess of nurse's knowledge regarding covid 19.

Assess of nurse's knowledge and practice was carried out three times firstly before training program, secondly immediately and thirdly after three months.

The observational checklist was filled by the researchers by observing the nurses. The time allowed for answers took about 30- 40 minutes.

Program implementation:

- This was primarily based totally on the studied nurses. The content of training program sessions was organized as the following.

- After the official permission were taken from director of Beni-Suef university hospital and nursing director, the implementation phase started.
- The program was implemented over 12-week period - The researchers approached the nurses, three days a week at morning shifts daily in in surgical and obstetric units at Beni-Suef University Hospital.
- Nurses were interviewed individually to explain the purpose and nature of the study, obtaining the written consent, their needs/expectations, discuss the outline of the program, and regulate the next visit and the best way for content.

The theoretical part:

Each theoretical session was carried out in class to include all nurses. All the topics were presented in the form of PowerPoint programs and posters as needed.

Theoretical sessions started with discussion (10 minutes) to assess nurse's feedback of knowledge about related topics then the researchers started to explain the session content (30 minutes). After the session break time was given to them, (10 minutes) followed by a discussion to assess the nurses' level of understanding and feedback (10 minutes).

Every session was started first with discussion to assess nurse's feedback about the procedure (10 minutes) then the training phase as the following:

- General information about covid 19 such as (definition causes, etiology, high risk person incubation period).

- Mode of transmission of covid 19.
- Signs and symptoms of covid 19.
- Diagnostic test of covid 19.
- Therapeutic treatment of covid 19.
- Complication of covid 19.
- Prevention of covid 19.

The practical part:

The researchers provided teaching material as videos about the procedure to help nurses during demonstrating it.

Each clinical session was repeated more than once on the same day and in the other day to be sure that every nurse reached an accurate skills level of the procedure.

Each nurse of all studied groups obtained a copy of the educational program in Arabic included all theoretical and practical content.

The educational aids to explain the topics included hand out, posters and clinical videos for a demonstration of the care provided.

The observational checklist was used during data collection to evaluate the nursing level of skills about covid 19 to ensure nurses' skills until the competency level.

The Evaluation stage:

After implementation of training program, the post test was administered to assess nurses' knowledge and practice using the same questionnaire sheet and same observational checklist of the pre- test. It was done twice, immediately after finishing training program and after three months from first evaluation, this helped to evaluate the effect of the implementing program

Statistical Design:

An IBM compatible personal computer was used to store and analyze data and to produce graphic presentation for some important results. Statistical package for the social science (SPSS) version 23 was used for statistical analysis of data, as it contains the test of significance given in standard statistical books.

Data were summarized using the arithmetic mean as an average, central tendency, the standard deviation as a measure of dispersion of results around the mean and frequency and percentage of observations. Other statistical tests such as correlation coefficient were calculated and p value was used to determine the relation between total knowledge score and total practice score. Also, Alpha Cronbach test was used to test reliability of tools.

Results

Table (1): Demonstrates that (47.5%) of the studied nurses' their age less than 25 years with a mean age was (25.98 ± 3.577) years, most (85%) of nurses were females, half (50%) of nurses were married. Regarding educational qualification (85%) of the studied nurses' had technical nursing education. Regarding the nurses' years of experience more than half (52.5%) of them were having from (1-5) with a mean years of experience was (5.81 ± 3.782) years.

Table (2): demonstrates that a highly significant positive correlation between nurses knowledge and practice at pre-program-implementation, knowledge and practice at post program implementation and knowledge and practice at follow up program implementation with R and p value (0.882/ 0.001, 0.854/.000 and 0.0928/0.000) respectively.

Fig. (1) illustrates that 65% of the studied nurses didn't attend any training courses related to covid 19.

Fig. (2) Illustrates that 87.5% of the studied nurses had unsatisfactory practice pre-program implementation which improved immediately post program and follow up program (90% and 77.5%) of the studied nurses had satisfactory practice regarding covid 19 respectively.

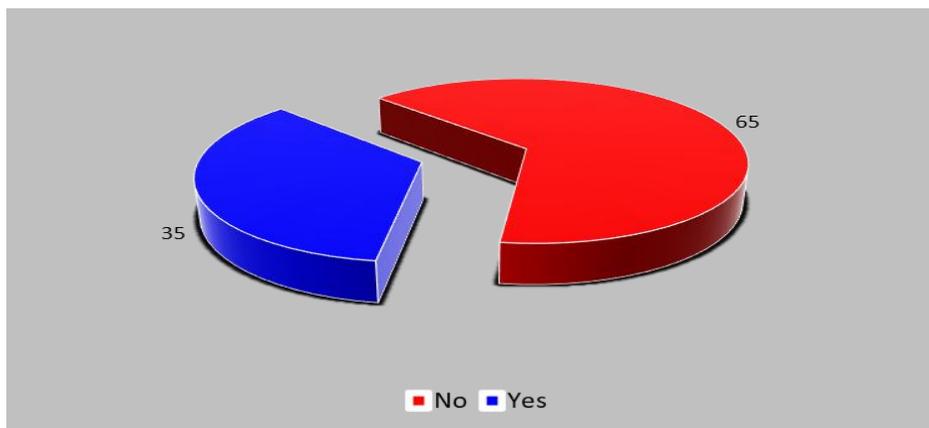
Fig. (3). illustrates that 90% of the studied nurses had unsatisfactory practice pre-program-implementation which improved immediately post program and follow up program (92.5% and 80%) of the studied nurses had satisfactory practice regarding covid 19 respectively.

Table (3) This table shows, there is no statistical significant relation between demographic characteristics of the nurses and their total nurses knowledge score at different phases of implementing the training program except age during post program, training course during follow up program. Qualification and years of experience during post and follow up of the program ($p < 0.001^{**}$, $p < 0.05$)

Table (4) table shows, there is no statistical significant relation between demographic characteristics of the nurses and their total nurses practice score at different phases of implementing the training program except age during post program, training course during follow up program. Qualification and years of experience during post and follow up of the program were ($p < 0.001$, $p < 0.05$, respectively).

Table (1): Percentage distribution of the studied nurses according to their demographic characteristics

Variable	Frequency	%
Age in years		
<25	19	47.5
25-<30	13	32.5
30≥	8	20.0
Mean ±SD	25.98±3.577	
Gender		
Male	6	15
Female	34	85
Marital status		
single	20	50
Married	20	50
Educational qualification		
Diploma nursing	3	7.5
Technical nursing education	34	85
Bachelor of nursing	3	7.5
Years of experience		
1-	21	52.5
5-	14	35
≥10	5	12.5
Mean ±SD	5.81±3.782	

**Fig. (1):** Percentage distribution of studied nurses' according attending training courses related to covid 19.

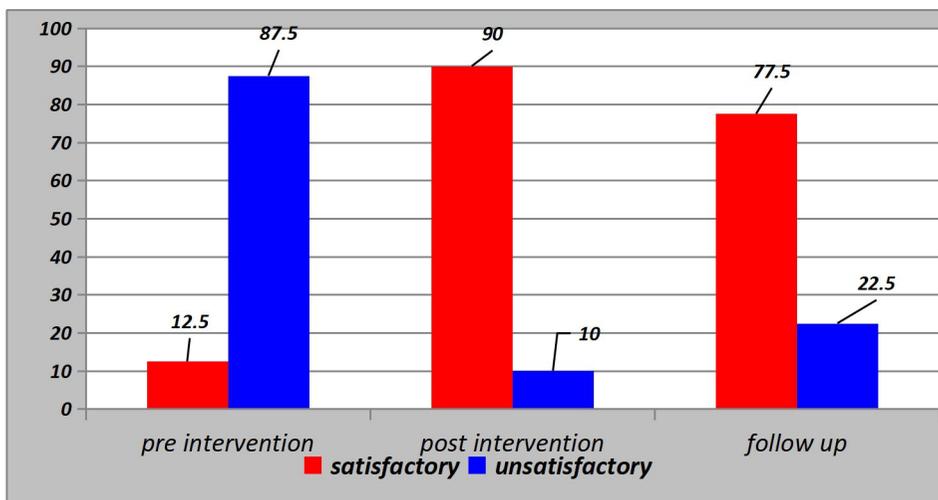


Fig. (2): Percentage distribution of studied nurses' total knowledge score regarding covid 19 at different phases of program.

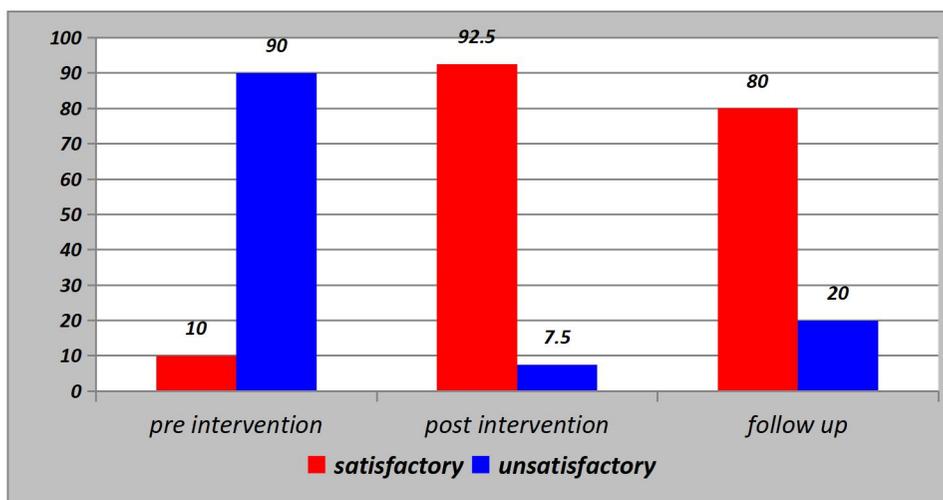


Fig. (3): Percentage distribution of studied nurses' total practice score regarding covid 19 at different phases of program.

Table (2): Correlation between nurses' total knowledge score and nurses' total practices scores at different phases of program

Total knowledge	Total practice		
	Pre-program	Immediate post-program	Follow-up
r	0.882**	0.854**	0.928**
p	0.000	0.000	0.000

Table (3): Relationship between nurses' total knowledge and demographic data (n=40).

Nurses' characteristics	Total Knowledge (pre-program)			Total Knowledge (post- program)			Total Knowledge (follow up)		
	Satisfactory		X ² and Sig	Satisfactory		X ² and Sig	Satisfactory		X ² and Sig
	No	%		No	%		No	%	
<i>Age (years)</i>									
< 25	2	5	0.167 0.920	18	45.0%	8.640 0.013	16	40	3.338 0.114
25 - 30	2	5		13	32.5%		11	27.5	
> 30	1	2.5		5	12.5%		4	10	
<i>Gender</i>									
Male	0	0	1.008	6	15	0.784	5	12.5	0.138
Female	5	12.5	0.315	30	75	0.376	26	65	0.711
<i>Qualification</i>									
Diploma	0	0	1.636 0.441	0	0	29.216 0.000	0	0	11.664 0.003
Technical nursing	4	10		33	82.5		28	70	
Bachelor of nursing	1	2.5		3	7.5		3	7.5	
<i>Years of experience</i>									
< 5	3	7.5	0.816 0.665	21	50	16.085 0.000	18	45	10.835 0.004
5- 10	2	5		14	35		12	30	
> 10	0	0		2	5		1	2.5	
<i>Training course</i>									
Yes	2	5	1.570	14	35	2.393	14	35	6.253
No	3	7.5	0.210	22	55	0.122	17	42.5	0.012

Table (4): Relationship between studied nurses' total practice level and demographic (n=40).

Nurses' characteristics	Total practice (pre)			Total practice (post)			Total practice (follow up)		
	Satisfactory		X ² and Sig	Satisfactory		X ² and Sig	Satisfactory		X ² and Sig
	No	%		No	%		No	%	
<i>Age (years)</i>									
< 25	1	2.5	0.948 0.622	19	47.5	12.973 0.002	17	42.5	5.739 0.057
25 - 30	2	5		13	32.5		11	27.5	
> 30	1	2.5		5	12.5		4	10	
<i>Gender</i>									
Male	0	0	0.784	6	15	0.572	5	12.5	0.049
Female	4	10	0.376	31	77.5	0.449	27	67.5	0.825
<i>Qualification</i>									
Diploma	0	0	2.200 0.333	0	0	40.000 0.000	0	0	13.346 0.001
Technical nursing	3	7.5		34	85		29	72.5	
Bachelor of nursing	1	2.5		3	7.5		3	7.5	
<i>Years of experience</i>									
< 5	2	5	0.847 0.655	21	52.5	22.703 0.000	19	47.5	12.976 0.002
5- 10	2	5		14	35		12	30	
> 10	0	0		2	5		1	2.5	
<i>Training course</i>									
Yes	2	5	0.440	14	35	1.746	14	17.5	5.385
No	2	5	0.507	23	57.5	0.186	18	35	0.020

Discussion:

Nurses have responsibility to reducing and controlling risks and limit spread of COVID-19 through update their knowledge and practice. Providing training program for nurses improve awareness about COVID-19. Subsequently, this study aimed to enhance nurses' knowledge and practices regarding COVID-19.

Misconception among nurses about the virus, its mode of transmission, and the essential steps to prevent infection as a result of this novel have delayed efforts to offer critical treatment in some cases, resulting in the rushing spread of infection in hospitals and putting patients at risk. (*Elshenawie, et al., 2020*).

This study indicated that nearly half of nurses were at the age less than 25 years. This result is agreed with *Eldesouky, (2021)* who stated that most nurses' age less than 25 years old. However, this result is in disagreement with *Shabaan,(2021)* who found that more than half of the study age group between $26 < 30$ years .

The present study showed that, the most of nurses were females. It might be related to school nurses' graduate large number of females than males. This finding is at the same line with study supported by *Saadeh et al., (2020)* who revealed that almost three-quarters of them were female.

Concerning the educational level, the present study indicated that, most of the studied nurses' had technical nursing education, that is a

leading factor for lack of knowledge and practice regarding caring for patients with covid 19. In the same line of *Eldesouky,(2021)* who revealed the same results.

Concerning years of experience, the present study revealed that more than half of the studied nurses were having from (1-5). This might due to the fact of workload and inadequate number of nurses. It is in the same line with *Nemati et al., (2020)* who found the same result.

Regarding attending training programs, the present study found that 65% of the studied nurses didn't attend any training courses related to covid 19. This may be due to lack of in-service training courses conducted by administrating staff inside the hospitals. *Ahmed, (2021)*, who found that, about three-fifth of the nurses surveyed had not previously received COVID-19 training.

The study revealed that majority of the study nurse had unsatisfactory level of knowledge and practice regarding COVID -19 this may be due to few training courses not included all nurses, shortage of nurses, workload, overloaded by more duties and having more work hours.

Meanwhile, obvious improvement in nurses' knowledge's scores was documented post-program implementation as compared to their pre-program with significant statistical difference. This indicates a positive impact of the program on the nurses' knowledge regarding COVID-19. This finding is supported by *Elgzar et al.,(2020)* who found a significant

difference in awareness related to COVID -19 after the intervention.

In addition *Elshenawie et al., (2020)* found that the total score of nurses knowledge regarding care for COVID-19 patients improved with a positive statistical significance difference after implementing the educational program.

From the analysis of study nurses' practices regarding covid 19 management, it was found that a highly statistically significant difference in total of practice between pre-program and post- program implementation. This reflects the effectiveness of training program on enhancing the nurses' performance regarding covid 19. This finding is supported by *Elshenawie et al., (2020) and Ahmed, (2021)*. In addition to *Asemahagn (2020)* who found that participants had good COVID-19 practices.

The results of the current study declare the nurses' total knowledge and practices regarding COVID-19 and its preventive measures; the pre-test of the present study revealed that most of the nurses had unsatisfactory knowledge and practices as well. This lack of knowledge, and practices may be attributed to that the majority of them had low or middle level of nursing education (Diploma nursing and Technical nursing education), did not have sufficient years of experience, and most of studied nurses' according attending training courses related to Covid-19.

After the implementation of the instructional program, the results indicated that there is a significant

improvement in nurses' knowledge, and practices. Moreover, the progression of satisfactory score nurses' grading and regression of unsatisfactory grading as well, after the implementation of the educational program compared to before, were observed associated with statistical differences.

This improvement/progression was also maintained up to the follow-up test (three-month later) through the observed results. This improvement could be attributed to that the entire sample was committed with the conducted program. In addition, attendance of the educational program sessions and the lecture and positive reinforcement or the long term store of knowledge, and practices as well as broad kind of used educational used methods were effective (*Hassan, 2019; Masters, 2013; Gamel, et al., 2020; Hassan, et al., 2017*).

The distributed Arabic booklets also, played a critical role in acquired and hold knowledge. Booklets are better used when they are concise, written in simple language, filled with useful pictures and when they are used to support other forms of education. This is, in accordance, with Edgar Dale's or the NTL's Pyramid of Learning as cited by Masters as the pyramid illustrated that individuals can hold 10.0% of what he read and 20.0% of what he sees and hear (audiovisual). The same author added that ones can hold 50.0% of what he learned by a discussion (*Hassan& Nasr 2017; Masters, 2013; Nady, et al., 2017; Hassan, 2016*).

The current study revealed that there was no relation between nurse's knowledge and their age, gender, educational level and years of experiences pre-program implementation. This may be due to the older nurses had got administrative duties beside the direct patients care, which not reflected the strong relation between age, years of experience and knowledge improvement. These results agreed with *Kamineni, et al, (2020)* who concluded that there was no significant relationship between levels of knowledge with their socio-demographic variables age, gender, and education. It is possibly due to differentiation between different areas of residence.

On the other hand results of *Refaat et al, (2021)* revealed that there was highly statistically significant relation between knowledge and socio-demographic characteristic (age, education, and experience) pre and post program.

The present study showed no relation between nurses' practices with their demographic characteristics pre-program implementation. This means that all the nurses under study had unsatisfactory practice regardless their level of education and the most senior nurses occupied administrative work more than case management and delegate the nursing activities to junior nurses, which result decreased on their performance. These results match with the results of *(Amanya, 2020)*, who found that the socio-demographic characteristics of health workers, including age, sex, education level,

occupation, working hours and work experience, had no statistically significant relationship with practice. This result contradicts with *(Refaat et al, 2021)*, who found a highly significant correlation between practice and demographics characteristics (education, experience, and job) pre and post-program.

The current study revealed that were a positive correlation between total nurses' knowledge and practice at pre, post and follow up program implementation. This result agreed with *Elasrag et al., (2021)* who found a strong link between nurses' knowledge and practice. Also *Gabr, Seif, & Allam, (2020)* and *Erfani, et al, (2020)*, revealed the same results.

Conclusion

Based on the findings of the current study, it could be concluded that all of the studied nurses had unsatisfactory levels of performance regarding covid 19 pre the program implementation. Meanwhile, the majority of the studied nurses had statistically significant improvement in their performance post-program implementation. While, this improvement lowered lightly post three months at follow up, which confirming the study hypothesis.

Recommendations

Based on results of the present study the following recommendations can be suggested:

1. Continuous evaluation of nurse's knowledge and practice regarding covid 19 to identify nurses needs and implement training programs to

refreshing and updating their performance.

2. Establishing booklet guideline for nurses regarding covid 19.
3. Regular meetings between nurses and their supervision should be conducted to evaluate and find way for improvement.
4. Implementing the educational training program on larger sample selected from different setting and different geographical areas of Egypt is necessary to increase the efficiency of nurses' performance regarding covid 19.

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