Effect of Educational Program on Maternity Nurses' knowledge, Attitude and Practice of Preventive Measures Towards COVID-19

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Abstract

Background: Nursing staff are at the frontline defense against the coronavirus disease 2019 (COVID-19) pandemic. Inadequate knowledge and incorrect attitudes among maternity nurses can directly influence practices and lead to delayed diagnosis, poor infection control practice, and spread of disease. **Aim:** Assess maternity nurses' KAP about covod19 & evaluate the effect of educational program on improving maternity nurses' knowledge, attitude and practice of preventive measures towards COVID19. **Methods:** Quasi experimental research design was used in this study. It was conducted at different departments of Women Health Hospital, Assiut University. **Sample** A convenient sample of a total 159 maternity nurses included in the study. Structured interview questionnaire was used and included two parts. An educational program was implemented to maternity nurses regarding COVID19. **Results:** there is highly statistical significance difference between pre & post program regarding total knowledge, attitude and practice of preventive measures towards COVID19 among studied maternity nurses p-value 0.001. **Conclusion:** The implementation of educational program significantly improved studied nurses' knowledge, attitude and practice of preventive measures toward COVID 19 evidenced by the pretest and posttest knowledge scores. **Recommendations:** Provide a continuous education and training programs to maternity nurses regarding COVID19 to achieve optimistic attitude and maintain safe practice regarding compliance with the preventive measures of COVID19.

Keywords: COVID 19, Educational program, KAP & Maternity nurses.

Introduction

Coronavirus is a category of contagions with diverse inheritable patterns infecting the respiratory system and known to be dead at multitudinous revolutions. Coronavirus infection causes multitudinous health problems arranging from the common cold to deadly pneumonia **(WHO, 2020)**.

On December 31, 2019, WHO was alerted about the occurrence of several cases of severe pneumonia at Wuhan city, China, and mainly in the wet seafood market. Later, on Jan 7, 2020, China government formally reported to WHO that they have an outbreak of new Coronavirus, which was named COVID-19 **(WHO, 2020)**.

WHO demonstrated the new coronavirus (COVID-19) revolution a globular epidemic on March 11, 2020. The COVID-19 accelerate veritably snappily with further than cases registered in114 countries and the figures of deaths reaching4291.5 By May 25, 2020, COVID-19 cases reached with deaths **(Prabhakar et al., 2020)** .

The contagion spreads from the infected person through numerous modes of transmission as the gate of exiting similar as coughing or sneezing letting little driblets in the air thus, the person who inhales similar driblets or touches the infected shells may too get the infection. Also , recent inquiries had recorded that the coronavirus has been detected in the coprolite of cases and presents gastrointestinal symptoms thus, the transmission of the contagion can be through the fecal-oral way **(Güner et al., 2020)**.

Cases with underlying diseases like diabetes and hypertension are at a higher threat of infection and have been noticed to present with a rigorous form of complaint **(Wang et al., 2019)**. The immunologic and physiologic modifications of gestation might make gravid women at higher threat of serious illness or mortality with Covid-19, compared with the overall people**. (Qiao, 2020)** Still, there's little data on Covid-19 infection during gestation **(Chen et al., 2020)**.

The novel coronavirus shows symptoms arranging from 2 to 14 days, allowing the disease to go undetected. Registered conditions have arranged from people with little to no symptoms to people who are badly ill and dying with registered Covid-19 infections. Symptoms may involve high temperature, cough, and breathing difficulties. Presently, curative management is mainly supportive with large emphasis being placed on the preventing of transmission of the contagion. To this end, WHO has recommended a series of preventative measures to stop the spread of the epidemic **(Murphy, 2020).**

Preventive measures are defined as the recent strategy to decrease the transmission of infection. These measures include early screening, diagnosis, isolation, and treatment to prevent recurrent spread. Preventive strategies are focused on the isolation of patients and the application of infection control precautions. One of the most important measures is environmental measures **(Aldowyan et al., 2017 & Omer et al., 2020)**

These measures are aimed at decreasing the threat of transmission of infection to individualities within the terrain through, **Firstly**, avoiding contact with an infected person, with things, tools, or polluted environmental surfaces. **Secondly,** reduce direct physical contact similar as shaking hands. **Thirdly,** avoid direct vulnerable contact with personal excretion specially coughing, sneezing and when touching the person should use paper tissues with bare hands. **Fourthly,** avoid direct contact and allow space between persons as 2 meter. **Fifthly**, reduce contact with people in a closed environment similar to hospital waiting areas beyond 15 min and at a distance of less than 2 meters in addition to the implementation of individual protective measures **(CDC, 2020 & WHO, 2020).**

The success of application of these measures is broadly dependent on the high realization and knowledge of the population. Nursing is an essential element of health care, and nurses' knowledge about disease directly affects outcomes of patients. Also, during an outbreak, nurses' Knowledge, practices, and attitude (KPA) play positive roles in improving the cases' recovery rate, reducing the length of the hospitalization, mortality, prevention of hospital infection and occupational exposure. In order to reduce the spread of transmission of this contagion, the nurses should have full awareness of the mode of transmission and preventative measures to break the chain of infection **(Alzoubi et al., 2020)**

Maternity services and maternity nurses are at risk of acquiring COVID-19 infection through providing care for women at outpatient and inpatient departments. Some references suggested that all healthcare workers in the labor and delivery rooms have to wear a face mask and change it between parturient women. Also, all maternity nurses and obstetricians should wear the full personal protective equipment during the second stage of labor or at cesarean delivery as gown, gloves, eye protection, and N95 mask. Non-adherence or poor knowledge and practices regarding infection control and prevention can lead to outbreaks in healthcare facilities. Maternity nurses have to be advised to get training regarding how to wear and take off personal protective equipment to optimize the outcomes in healthcare settings **(Neuwirth et al., 2020).**

Last but not least, the nurses are the backbone of health systems. A healthy and skilled workforce is the basic requirement to ensure a healthy community and this is even more important during crises such as the COVID-19 pandemic. It is also important that nurses in general and maternity nurses in specific have to have good knowledge about the coronavirus infection and practice preventive measures to protect themselves, women at the hospital, and the community at large. This level of maternity nurses' knowledge about the coronavirus pandemic could be one of the contributory factors behind exemplary control of the spread of infection **(Baskin & Bartlett, 2021)**.

Significant of study:

Pregnant women with COVID-19 are at higher risk of severe symptoms and outcome including ICU admission, requiring ventilator and death **(Hala et al., 2021)**.

To reduce risk of severe outcome, It is important to provide maternity nurses with the latest knowledge, including the COVID-19 test, isolation, social distance, and the use of personal protective measures for protecting pregnant women from the COVID-19 **Chen et al., 2020.**

Up to the knowledge of the researchers, there were many studies conducted to assess maternity nurses' knowledge, attitude and practice of preventive measures towards COVID-19 which recommended with essentially of making educational programs for nurses about COVID-19 outlined by WHO and Ministry of Health and Population in Egypt, with periodical evaluation to ensure adherence to the preventive measures and enhance nurses' willingness to work and care for patients with COVID-19.

Hence the current study was carried out to assess effect of educational program on maternity nurses' knowledge, attitude and practice of preventive measures towards COVID-19. Such knowledge would enlighten the path to improve the quality of the services, which would ultimately lead to a decrease in the spread and the mortality from COVID-19pandemic.

Aim of the study:
This study aimed to:
- Assess maternity nurses' knowledge, attitude and practice about covod19.
- Evaluate the effect of educational program on improving maternity nurses' knowledge, attitude and practice of preventive measures towards COVID-19.

Research hypothesis:
H0: No improvement in nurses' KAP regarding covid19 after implementation of educational program.

H1: The nurses who attend the educational program will exhibits higher knowledge, excellent practice and positive attitude than those who did not attend the program.

Subjects & Methods

Subjects and methods of this study are displayed into four designs technical, operational, administrative, and statistical design.

Technical Design

Which involved research design, setting, study sample, and tools of data collection.

Research Design

A quasi-experimental (one group pre-posttest) design was used in this study.

Setting

This study was conducted at Women Health Hospital, Assiut University, where service all areas of Upper Egypt. It is a building that has a six floor, five for governmental admission and the last one for private service.

Sample

A convenience sample of 159 maternity nurses who working at different departments (50 nurses in emergency ward, 34 nurses in intensive care unit, 43 nurses in inpatient wards, 16 nurses in operation ward and 16 nurses in outpatient clinics) at the previously mentioned hospital were recruited.

Tools of the study

A structured interview questionnaire was developed by the researchers. The questions were designed based on reviewing previously conducted research **(Abdelhafiz, et al., 2020),** and visiting the Ministry of Health and Population (MOHP) and WHO websites for frequently were asked questions **(WHO, 2020).** Questions were written in Arabic and were adapted to suit participants. It involved two parts:

Part one: included Maternity nurses' socio-demographic and professional data as (age, marital status, years of experience, level of education, working position, working unit, source of information about COVID-19 and getting training program before.

Part two: included three sections to assess knowledge, attitude and practice of maternity nurses.

The knowledge section: This section was adapted from **Mohammed, (2021)**, developed and used by the researchers to assess the maternity nurses' knowledge toward COVID19. It included 20 questions covering the main general information about COVID-19 as mode of transmission, clinical picture, high risk and ways of prevention.

Knowledge scoring system:

The total questions were 20, each correct answer was given 1 score and incorrect or don't know given 0, the total score ranged from 0-20. The total knowledge

considered efficient if ≥ 70% (14 score) and inefficient if <70% (14 score).

The attitude section: This section was adapted from **Mohammed, (2021)**, and used by the researchers to measure maternity nurses' attitude toward COVID19. It included 8.

Attitude scoring system:

The total questions were 8, scoring graded from agree (which given 3), unsure (given 2) and not agree given (1), the total score ranged from 1-24. The total attitude considered positive if ≥ 70% (17 score) and negative if <70% (17 score).

The practice section COVID19 This section was adapted from **(Nwagbara et al., 2021)** and used by the researchers to appraise the maternity nurses' practices regarding the preventive measures of COVID-19 pandemic. It included 23 questions.

Practice scoring system:

The checklist questions were 23, each correct action was done given 2 score, sometimes done was given 1 and incorrect action was given 0, the total score ranged from 0-46. The total practice considered satisfactory if ≥ 70% (32 score) and unsatisfactory if <70% (32 score).

Tools Validity

Tools were reviewed by a panel of 3 experts in the field of maternity and newborn health nursing and obstetrics and gynecological medicine for clarity and comprehensive.

Tools Reliability

The internal consistency of the tool scale was calculated by using Cronbach's Alpha; and it was8.809E-7.

Operational design

It was displayed in two phases, pilot study and field work.

Pilot study

Pilot study was included (10%) according to inclusion of the sample size (15 nurses) to evaluate the clarity and efficiency of the tool used in the study.

Field work

Data collection of this study was taken six months started from the beginning of December 2020, and completed by the end of May 2021. This was achieved in three phases, pre intervention, intervention and post intervention.

Pre-intervention assessment

Upon securing official permission to conduct the study. The researchers interviewed with each maternity nurse individually, explain the purpose of the study and method of implementation of educational program, and took their consent on participation on the study. After that personal data was taken and ask them to fill data regarding knowledge, attitude toward COVID19 as a form of pretest and practices of protective measures regarding

COVID19 was assessed through checklist by the researchers.

Intervention phase:

Carrying out of educational program which took about 19 weeks or nearly 5 months. The researcher visited the previous involved setting two days/ week with a performance of two sessions every day to the maternity nurses; each session involved a small group with a number of 2 nurses. It was implemented in a form of lecture to each group.

Session took a time of 40-60 minute to explain all information regarding COVID-19 Pandemic including definition, clinical features, mode of transmission, incubation period, high risk people, diagnosis, treatment, practices of protective measures to avoid spreading of COVID-19 among pregnant women. The course contents were inspired by the updated Centers for Disease Control and Prevention (CDC) and WHO guidelines. Different teaching methods were used to reach to intended objective as lecture, group discussion, problem solving and critical thinking. Also a copy of booklet was given to each nurse as a supportive material.

Post intervention phase

After 4 weeks of the session, the researcher interviewed again with the nurses involved in the session to perform a post test that had the same pretest questions in addition to checklist part for evaluating if practice of protective measures were done or not done.

Administrative design

This study was carried out under the approval of faculty of nursing's Ethical committee, Assiut University, also an official permission was obtained from the director of Woman Health Hospital, informed consent was taken from each nurse involved in the study, confidentiality was assured. The nurse was freely to withdraw from the study at any stage.

Statistical design

The collected data were organized, categorized, coded, tabulated and analyzed using the Statistical Package for social sciences (SPSS) version 23. Data were presented and tables and charts using numbers, percentages, means, and standard deviation Correlation between variables (Pearson correlation) and chi-square test was used statistical significance was considered at P-value ≤ 0.05.

Results

Table (1): Distribution of studied sample according to sociodemographic characteristics

Socio demographic characteristics	N (159)	%
Age group:		
• Less than 25 year	69	43.4
• 25-40 year	61	38.4
• More than 40 year	29	18.2
Age mean± SD	**29.3±6.7**	
Marital status:		
• Single	69	43.4
• Married	85	53.5
• Divorced	5	3.1
Years of experience:		
• Less than 5 year	67	42.1
• 5-10 year	32	20.1
• More than 10 year	60	37.8
Level of education:		
• Secondary nursing school	78	49.1
• Technical institute of nursing	50	31.4
• University qualification	27	17.0
• Master degree	4	2.5
Working position		
• Clinical nurse	104	65.4
• Nurse supervisor	31	19.5
• Technical nurse	24	15.1
Working unit:		
• Emergency ward	50	31.4
• Intensive care unit	34	21.4
• Inpatient wards	43	27.0
• Operations ward	16	10.1
• Outpatient clinic	16	10.1

Table (2): Distribution of studied sample according to source of maternity nurses' knowledge before intervention

Source of women information	N (159)	%
MOHP and WHO website		
• Yes	72	45.3
• No	87	54.7
Social media		
• Yes	96	60.4
• No	63	39.6
Newspaper		
• Yes	19	11.9
• No	140	88.1
TV		
• Yes	59	37.1
• No	100	62.9
Physicians		
• Yes	63	39.6
• No	96	60.4
Friends/family		
• Yes	37	23.3
• No	122	76.7
Training Courses		
• Yes	39	24.5
• No	120	75.5

Table (3): Distribution of studied sample according to previous experiences regarding COVID-19

Previous experiences	N (159)	%
Attending training courses regarding COVID19		
• Yes	39	24.5
• No	120	75.5
Caring for a pregnant woman with suspected COVID-19:		
• Yes	90	56.6
• No	69	43.4
Caring for a pregnant woman diagnosed with COVID-19:		
• Yes	70	44.0
• No	89	56.0
Presence of a relative diagnosed with COVID-19:		
• Yes	80	50.3
• No	79	49.7
COVID-19 diagnosis in nurses:		
• Yes	111	69.8
• No	48	30.2

Table (4): Distribution of studied sample according to availability of preventive measures in the woman's health hospital:

Preventive measures	N (159)	%
Wearing mask :		
• Yes	154	96.9
• No	5	3.1
Wearing Personal Protective Equipment (PPE):		
• Yes	143	89.9
• No	16	10.1
Hand washing with water and soap:		
• Yes	159	100.0
• No	0	0.0

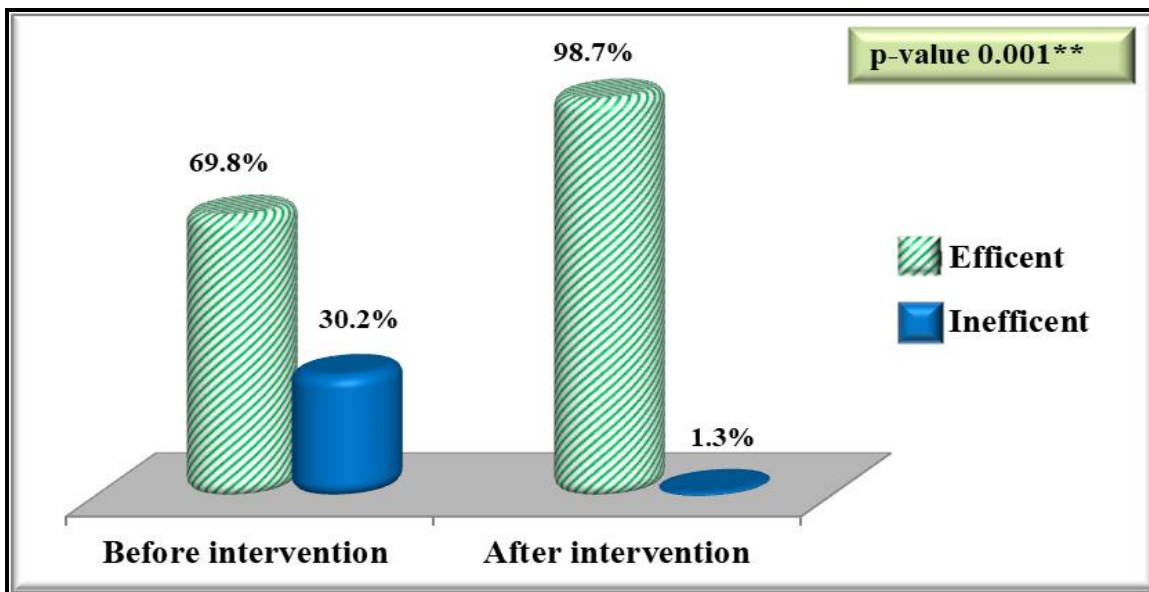| Preventive measures	N (159)	%
Sufficient distance between patients:		
• Yes	124	78.0
• No	27	17.0
• I don't know	8	5.0
Presence of sanitizers and hand washing station:		
• Yes	158	99.4
• No	1	0.6
Regular cleaning and decontamination:		
• Yes	149	93.7
• No	4	2.5
• I don't know	6	3.8

Figure (1): Total knowledge of studied sample in before and after educational intervention
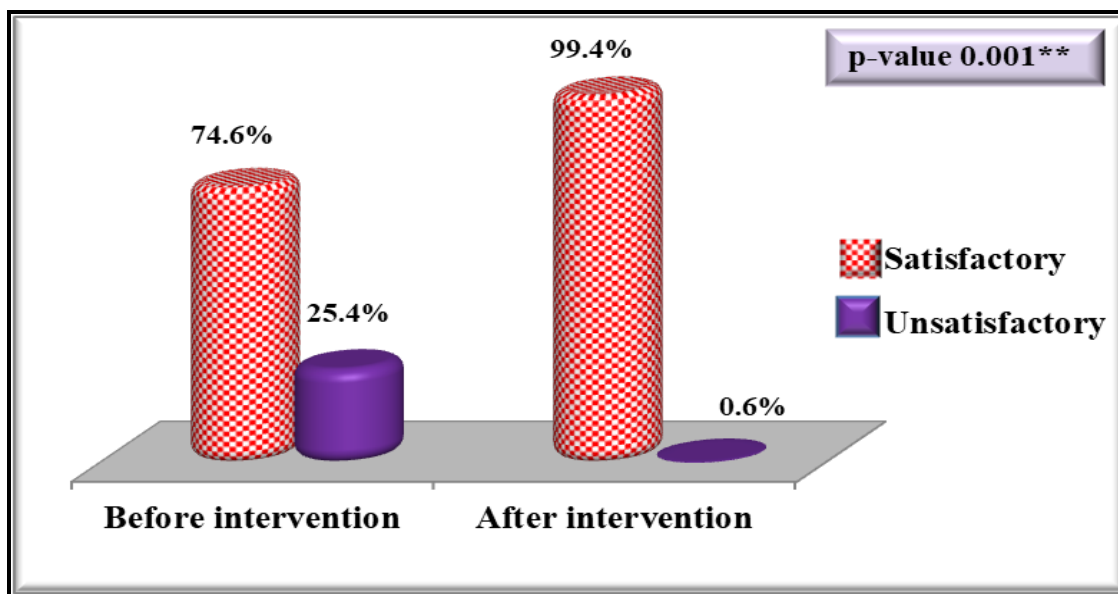*(**) highly statistical significant difference*

Figure (2): Total practices of studied sample in before and after educational intervention
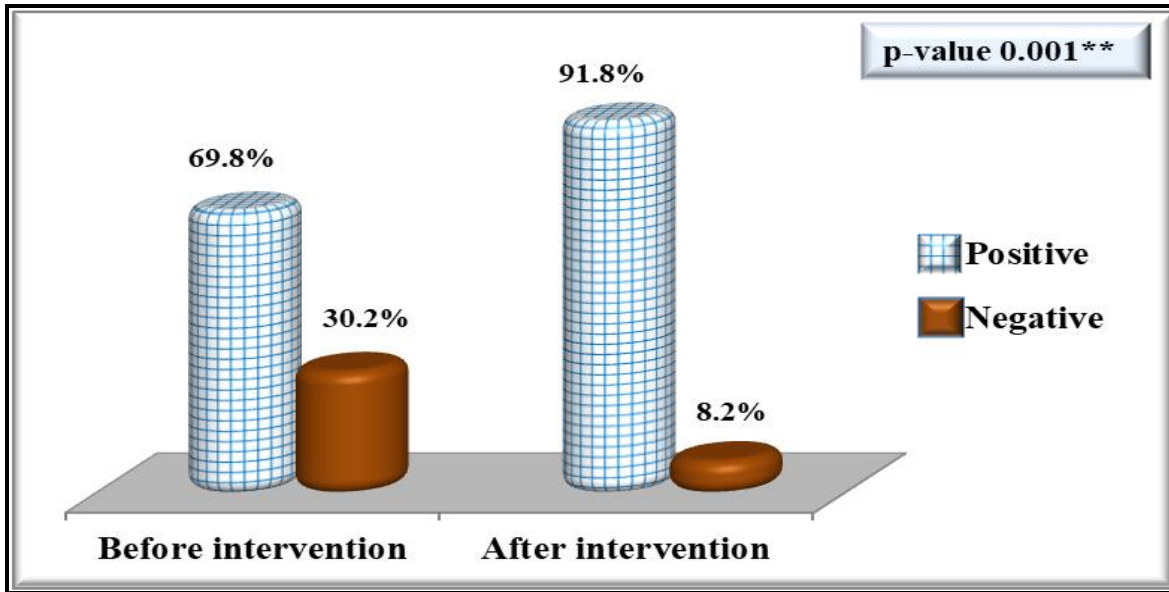*(**) highly statistical significant difference*

Figure (3): Total attitude of studied sample in before and after educational intervention
(**) highly statistical significant difference

Table (5): Mean and SD of total knowledge, practices and attitude of studied sample before and after educational intervention

Variable	Before intervention	After intervention	T-test	
	Mean ±SD	Mean ±SD	T	p-value
Total knowledge:	13.89±3.1	18.45±0.890	58,158	**0.001**[**]
Total practices:	37.67±5.37	43.20±1.98	32.60	**0.001**[**]
Total Attitude:	18.01±2.63	21.92±1.64	51.90	**0.001**[**]

(**) highly statistical significant difference

Table (6): Relation between total knowledge before intervention and socidemographic characteristics of studied sample

Variable	Total knowledge before intervention				Chis-quare	
	Efficient (111)		Not efficient(48)			
	N	%	N	%	X^2	p-value
Age group:						
• Less than 25 year	53	47.7	16	33.3	7.32	**0.026**[*]
• 25-40 year	35	31.6	26	54.2		
• More than 40 year	23	20.7	6	12.5		
Marital status:						
• Single	56	50.5	13	27.1	7.45	**0.024**[*]
• Married	52	46.8	33	68.7		
• Divorced	3	2.7	2	4.2		
Years of experience:						
• Less than 5 year	50	45.1	17	35.4	1.41	**0.493**
• 5-10 year	22	19.8	10	20.8		
• More than 10 year	39	35.1	21	43.8		
Level of education:						
• Baccalaureate	21	18.9	6	12.5	19.82	**0.001**[**]
• Technical	44	39.7	6	12.5		
• Diploma	42	37.8	36	75.0		
• Master degree	4	3.6	0	0.0		

Variable	Total knowledge before intervention				Chis-quare	
	Efficient (111)		Not efficient(48)			
	N	%	N	%	X²	p-value
Working position						
• Clinical nurse	79	71.2	25	52.1		
• Nurse supervisor	24	21.6	7	14.6	17.87	**0.001****
• Outpatient treatment units	8	7.2	16	33.3		
Working unit:						
• Emergency unit	23	20.7	27	56.3		
• ICU unit	26	23.5	8	16.7		
• Wards	37	33.3	6	12.5	21.93	**0.001****
• Operations	11	9.9	5	10.3		
• Outpatient clinic	14	12.6	2	4.2		

(**) highly statistical significant difference

(*) statistical significant difference

Table (7): Relation between total practices before intervention and socidemographic characteristics of studied sample

Variable	Total practices before intervention				Chis-quare	
	Satisfactory (119)		Unsatisfactory (40)			
	N	%	N	%	X²	p-value
Age group:						
• Less than 25 year	43	36.1	26	65.0		
• 25-40 year	51	42.9	10	25.0	10.2	**0.006****
• More than 40 year	25	21.0	4	10.0		
Marital status:						
• Single	51	42.9	18	45.0		
• Married	63	52.9	22	55.0	1.73	**0.420**
• Divorced	5	4.2	0	0.0		
Years of experience:						
• Less than 5 year	41	34.5	26	65.0		
• 5-10 year	25	21.0	7	17.5	12.6	**0.002****
• More than 10 year	53	44.5	7	17.5		
Level of education:						
• Baccalaureate	22	18.5	5	12.5		
• Technical	36	30.2	14	35.0		
• Diploma	57	47.9	21	52.5	2.32	**0.509**
• Master degree	4	3.4	0	0.0		
Working position						
• Clinical nurse	75	63.0	29	72.5		
• Nurse supervisor	27	22.7	4	10.0	3.08	**0.214**
• Outpatient treatment units	17	14.3	7	17.5		
Working unit:						
• Emergency unit	34	28.6	16	40.0		
• ICU unit	27	22.7	7	17.5		
• Wards	33	27.7	10	25.0	2.05	**0.726**
• Operations	13	10.9	3	7.5		
• Outpatient clinic	12	10.1	4	10.0		

(**) highly statistical significant difference

Table (8): Relation between total attitude before intervention and socidemographic characteristics of studied sample:

Variable	Total attitude before intervention				Chis-quare	
	Positive (111)		Negative (48)			
	N	%	N	%	X^2	p-value
Age group:						
• Less than 25 year	53	47.7	16	33.3		
• 25-40 year	39	35.2	22	45.9	2.85	**0.240**
• More than 40 year	19	17.1	10	20.8		
Marital status:						
• Single	52	46.8	17	35.4		
• Married	58	52.3	27	56.3	6.99	**0.030***
• Divorced	1	0.9	4	8.3		
Years of experience:						
• Less than 5 year	50	45.0	17	35.4		
• 5-10 year	17	15.3	15	31.3	5.32	**0.070**
• More than 10 year	44	39.7	16	33.3		
Level of education:						
• Baccalaureate	25	22.5	2	4.2		
• Technical	26	23.4	24	50.0	16.05	**0.001**[**]
• Diploma	56	50.5	22	45.8		
• Master degree	4	3.6	0	0.0		
Working position						
• Clinical nurse	66	59.5	38	79.2		
• Nurse supervisor	29	26.1	2	4.2	10.39	**0.006**[**]
• Outpatient treatment units	16	14.4	8	16.7		
Working unit:						
• Emergency unit	39	35.1	11	22.9		
• ICU unit	24	21.6	10	20.9		
• Wards	27	24.4	16	33.3	3.02	**0.554**
• Operations	11	9.9	5	10.4		
• Outpatient clinic	10	9.0	6	12.5		

(**) highly statistical significant difference
(*) statistical significant difference

Table (1): show more than half of studied nurses (53.5%) were married, and near half of them (43.4%) aged than 25 years old. In general,(49.1 %) of nurses were having a secondary school,(53.0 %) of them worked in emergency ward and intensive care unit, and(42.1 %)of them had less than 5 years of work experience.

Table (2): Reveals source of knowledge of maternity nurses about COVID19 before intervention, and finds that there is about 60.4% of them heard about COVID 19 from social media, about 45.3% from MOHP and WHO website, and about 39.6% from physicians.

Table (3): Demonstrates maternity nurses' previous experiences regarding COVID-19 and finds that about 75.5% of maternity nurses don't attend training courses regarding COVID19,about 56.6% of maternity nurses provide care for a pregnant woman with suspected COVID-19, about 44% provide care for a pregnant woman diagnosed with COVID-19, about 50.3% of maternity nurses had a relative

diagnosed with COVID-19, and about 30.2% of nurses were diagnosed with COVID-19.

Table (4): Shows preventive measures which available in the woman's health hospital, it was found that 96.9%, 89.9%, 100.0%, 78.0%, 99.4%, 93.7% for availability of wearing mask, wearing PPE, hand washing with water and soap, sufficient distance between patients, Presence of sanitizers and hand washing station, regular cleaning and decontamination respectively.

Figure (1): Clarifies knowledge of maternity nurses about COVID19 before and after intervention of educational program, and finds that increasing of efficient knowledge from 69.8% to 98.7%, decreasing of inefficient knowledge from 30.2% to 1.3% with highly statistical significance difference between pre&posttest regarding knowledge with p-value (0.001 and 0.001) respectively.

Figure (2): Shows studied maternity nurses' practices of protective measures before and after intervention

of educational program, and finds that there is highly statistical significance difference between satisfactory and unsatisfactory practices with p-value (0.001).

Figure (3): Clarifies maternity nurses' attitudes toward COVID19 , and finds that increasing of positive attitude from 69.8 % to 91.8%, and decreasing of negative attitude from 30.2% to 8.2% with highly statistical significance difference between pre&posttest regarding attitude p-value (0.001 and 0.001) respectively.

Table (5): Illustrates total knowledge, practices and attitude of maternity nurses before and after intervention of educational program, and displays that there is highly statistical significance difference between pre &posttest regarding total knowledge, practices and attitude p- value 0.001 for all.

Table (6): Show that there is relation between total knowledge of nurses before intervention and age, marital status, educational qualification, working position and working unit p-value (0.026, 0.024, 0.001 , 0.001 and 0.001 respectively). And there is no relation between total knowledge in pretest and years of experiences with p-value (0.493).

Table (7): Demonstrates that there is relation between total practices of nurses before intervention and age & years of experiences with p-value 0.006 and 0.002 respectively. And there is no relation between total practices in pretest and marital status, educational qualification, working position and working unit with p-value (0.420, 0.509, 0.214, 0.726) respectively.

Table (8): Illustrates that there is relation between attitude of nurses related to protective measures and marital status, education qualification and working position with p-value (0.030, 0.001, and 0.006 respectively). And there is no relation between total knowledge in pretest and age, experience and working unit with p-value (0.240, 0.070, and 0.554) respectively.

Discussion

The COVID-19 is an emerging infectious disease that has a significant threat to community health. Infection control and preventive measures reduce the spread of the serious threats of COVID-19, which is affected by health care workers knowledge, attitudes, and practices. Infection Prevention and Control recommendations can only be set after recognizing how health care workers perceive COVID-19 and translate their knowledge into practice to minimize the risk of infection **(WHO, 2020).**

Thus, the current study was carried out to assess effect of educational program on maternity nurses' knowledge, attitudes, and practices regarding preventive measures of COVID-19 pandemic.

The Current study shows that nearly two-thirds of maternity nurses had adequate knowledge, nearly three quarter were practicing precautionary behaviors and nearly two-thirds had a positive attitude to COVID-19. From a researcher's point of view, this may be due to the extensive coverage of COVID-19 by the WHO and the Egyptian Ministry of Health and Population, which helps to simplify information access. In addition, there are also training programs conducted by the Ministry of Health and Population, hospitals, Health insurance organizations, and online caregivers to understand COVID-19 preventive measures.   .

This finding is in line with other studies that had shown satisfactory levels of knowledge about COVID-19 **(Al-Hanawi et al., 2020)** Similarly, **Limbu et al. (2020),** who study healthcare workers' knowledge, attitude and practices during the COVID-19 pandemic response in a tertiary care hospital of Nepal, they found a medical staff has a higher level of knowledge and clinical practice regarding COVID-19. They concluded that during the COVID-19 pandemic, education and training are needed to improve positive attitudes and practices at work. These findings are consistent with studies conducted in Saudi Arabia **(Asaad et al., 2020),** Ethiopia **(Tadesse, et al., 2020),** and Pakistan **(Khan et al., 2020).**

In the current study, more than half of the studied nurses gained knowledge about the disease and its transmission, via social media followed by nearly half of them gained knowledge from online websites and more than one third through TV and work place. This result was supported by **(Abd El Fatah et al., 2020),** who study Knowledge, Attitude, and Behavior of Egyptian Medical Students Toward the Novel Coronavirus Disease-19, they reported that Facebook and other platforms were the most common sources of information.   .

In this regard, a study conducted by **(Kamaooko et al., 2021)** who study Knowledge, Attitudes, and Practices Regarding COVID-19 among Healthcare Workers in Uganda, they showed that strict government preventive measures, the accessibility of online and TV information, and the publication of professional information on social media are the reasons for the high level of HCWs` knowledge. This result is agree with other researches in China **(Zhong et al., 2020)**, Nigeria **(Reuben et al., 2020),** and Egypt **(Abdelhafiz et al., 2020).** Regarding relation knowledge and sociodemographic characteristics the current study showed highly statistically significant positive correlation between knowledge and sociodemographic characteristic (education, working position and working unit) pre program p=0.001, while statistically significant

positive correlation between knowledge and sociodemographic characteristic(age and marital status) p (0,026 and 0,024) respectively and there is insignificant correlation between knowledge and expeirence pre program.

This result disagree with **Nemati, et al., (2020)** who study Assessment of Iranian Nurses' Knowledge and Anxiety Toward COVID-19 During the Current Outbreak in Iran, they found a total knowledge score was not affected by age and education level ,but agree with him in the level of experience where he found that it was not significantly different between nurses with less or more work experience. also inconsistent with **Kamineni, et al., (2020)** who studied Knowledge of COVID-19 among nursing and Allied health care professionals working in tertiary care hospital, they founded there was no significant relationship between levels of knowledge with their socio demographic variables age, gender, education. This may be different sociodemographic area. Regarding attitude, the current study revealed that nearly two third of the studied sample had a positive attitudes towards COVID-19. The current study finding was in line with **Tadesse et al**. **(2020)** who studied knowledge, attitude, practice and psychological response toward COVID-19 among nurses during the COVID-19 outbreak in northern Ethiopia, they had found that 72% of the studied nurses had a favorable attitude towards COVID-19. **Huynh et al**. **(2020)** who studied knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. Asian, they had found that the majority of the studied healthcare workers had good knowledge and a positive attitude towards COVID-19. **Bhagavathula et al**. **(2020)** who studied knowledge and Perceptions of COVID-19 Among Health Care Workers: Cross-Sectional Study. JMIR public health and surveillance, they had found that positive perceptions of COVID-19 prevention and control of the studied population.

It was also observed highly significant positive correlation between attitude and demographics characteristics (education and working position) pre-program while significant correlation between attitude and marital status , and there is insignificant correlation between attitude and age, experience, and working unit pre program. The result similar with **Huynh, et al., (2020)** founded that occupation was significantly associated with attitude.

Concerning practices, the present study displayed that the majority of the studied nurses had a good satisfactory level towards practices of prevention measure of COVID-19. This finding is supported by **(Tadesse et al., 2020).** Who found that about two-thirds of the studied nurses had good infection prevention practice towards COVID-19. In our finding found highly significant correlation between practice and demographics characteristics (age and experience) pre- program p value (0.006,0.002) respectively.

This result disagrees with **Amanya et al., (2020)** who study" Knowledge and Compliance with Covid-19 Infection Prevention and Control measures among Health Workers in Regional Referral Hospitals in Northern Uganda: A cross- sectional Online Survey" The sociodemographic characteristics of health workers, including age, sex, education level, occupation, working hours and work experience, had no statistically significant relationship with Cvid-19 IPC knowledge or compliance.

The current study results showed high statistically significant difference between pre- and post-program p value= 0.001. regarding total knowledge, attitude and practice of preventive measures toward COVID19, where found that 30.2 of nurses had inefficient knowledge preprogram compared by 98.7% of nurses had efficient knowledge post program .Regarding total practice25.4% of nurses had unsatisfactory practices preprogram compared by 99.4% had satisfactory practices post program Moreover, total attitude, 30.2% had a negative attitude preprogram compared to 91.8% had a positive attitude post-program.

This finding is in line with **(Amira et al., 2021)** who study effect of educational program on maternity nurses regarding precautionary and preventive measures at labor unit during COVID 19 in Egypt, who found that 41.1% of nurses had poor knowledge preprogram compared by 80% of nurses had good knowledge post program with high statistically significant difference between pre- and post-program p value= <0.001. Regarding total attitude, 32.2% had a negative attitude preprogram compared to 90% had a positive attitude post-program with significant differences p=<0.05 and high statistically significant difference regarding all other items of attitude between pre- and post-program p value= <0.001, Moreover 32.2% of nurses had unsatisfactory self-reported practices preprogram compared by 90% had satisfactory post program.

Conclusion
The implementation of educational program significantly improved studied nurses' knowledge, attitude and practice of preventive measures toward COVID 19 evidenced by the pretest and posttest knowledge scores.

Recommendations
Based on the findings of the present study, the following recommendations are suggested:

1. Study should be generalized to include maternity nurses in both governmental and health hospital.
2. Provide a continuous education and training programs in the form of attending workshops, conferences to maternity nurses regarding COVID19 to achieve optimistic attitude and maintain safe practice regarding compliance with the preventive measures of COVID19.
3. Continuous updating for the content of nursing education curricula in epidemiology, public health, and principles of infection control to ensure that nurses are sufficiently qualified to play frontline nursing roles especially during pandemic.

Acknowledgement

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