

The effect of the staff development program on nursing evidence-based performance regarding Covid -19 pandemic in the obstetrics - gynaecology and paediatrics departments

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Abstract

Background: COVID-19 pandemic constituted significant challenges in obstetric and pediatric health care services. Maternity and paediatrics staff are at high risk of occupational exposure to Covid-19, predominantly among pregnant women and children often asymptomatic for Covid-19 so that infections may go unrecognized. Staff development programs regarding infection prevention and control using nursing evidence-based practice regarding the covid -19 pandemic in the obstetrics - gynaecology and paediatrics wards were part of the needed response. **Aim:** Evaluate the effect of the staff development program on Nursing Evidence-Based performance regarding the Covid -19 pandemic in the obstetrics, gynaecology and paediatrics departments. **Methodology:** A quasi-experimental method and an interventional pre and post-test were used to study a sample of 112 nurses. A purposive sample technique was used to choose the sample from the obstetrics-gynaecology and paediatrics departments using 4 tools to collect the data **Results:** The findings revealed a marked improvement in nurses' Knowledge of COVID-19 post-implementation of the program compared to pre-intervention. 79.5 % of the studied sample have good Knowledge regarding Covid-19 post implementation of the program, compared to 38.4 % pre-implementation. Also, 26.0% of them carried out the practice needed for Covid-19 most of the time post-program compared to 4.5% post program, and 28.0 % of the studied sample had a positive attitude regarding Covid-19 post implementation program, compared to 17.0 pre-implementation. Moreover, 91% of them were satisfied with the program compared to 9% dissatisfied. **Conclusion:** Translating evidence into practice during a Covid-19 pandemic to establishing a staff development program is the best possible provision of healthcare and guarantees preventive measures for the healthcare providers and is critical in facing Covid-19 and working in the complete chain of health care. **Recommendations:** A staff development program related to Covid-19 must be periodically held for maternity and pediatric health staff.

Keywords: The staff development program, evidence-based performance, obstetrics – gynaecology ward, paediatrics wards.

Introduction:

Health care workers have an essential role in combating the COVID-19 pandemic, and they are the most vulnerable group in society to contracting this virus while performing their work. Therefore, the impact of the COVID-19 pandemic on health care providers has been outrageous (Garralda Fernandez et al., 2021). However, prevention is the best way to protect healthcare workers from the COVID-19 pandemic. Therefore, commitment to infection prevention control protocols is critical in reducing health care workers' exposure to the novel coronavirus (El-Sokkary et al., 2021).

Recently, during the COVID-19 Pandemic, rigorous measures of Infection Prevention Control (IPC) have been adopted to prevent healthcare-associated transmission of COVID-19 (Rhee et al., 2020). The unexpected threat of the emerging coronavirus provided the urge to deploy Infection Prevention Control strategies at the level of different hospitals, such as enforcing mask-wearing at the general level, limiting visitors, spreading droplets and establishing precautions for contact with respiratory patients (Wang et al., 2020).

The WHO considered the COVID-19 outbreak a global pandemic on March 11 2020; strict actions have been taken to reduce the spread of the infection worldwide (WHO,

2020d). The first COVID-19 case was publicized in Egypt on February 16 - 2020. The Egyptian authorities declared 69814 proven COVID-19 cases on July 2 (WHO, 2019). Globally, In 2019, more than 22,000 healthcare workers have already been infected with Covid-19. This number may under-report the actual number of COVID-19 among healthcare workers due to the lack of regular reporting of such cases to the WHO (WHO, 2021b). In Egypt, no formal estimation of the number of Covid-19 infected among health care workers has occurred so far (El-Sokkary et al., 2021).

The hospital environment is considered one of the causes of the spread of Covid -19; this is represented in the hospital environment elements close to the patient, such as bed equipment, curtains, hospital sinks and drains. When hand hygiene and environmental cleaning standards are used, healthcare-associated COVID-19 transmission is minimized (Aranega-Bou et al., 2019).

Evidence-based performance (EBP) is defined as a systematic method of evaluating the best available scientific evidence from studies and clinical experience, including patient interests, beliefs, expectations, and needs to make a clinical decision that will affect patient care in particular circumstances (Melnyk et al., 2012). EBP has become a suitable framework and the predominant care model that has been recognized for facilitating the transfer of research evidence to clinical practice. EBP is the leading standard and problem-solving approach to providing safe patient care (Shifaza et al., 2014).

Providing high-quality health care services depends on clinical decision-making in nursing and midwifery and the coordination of evidence-based care. Therefore, it is necessary to strengthen evidence-based practice and apply the best available evidence to improve the quality aspects of health care. The nursing and midwifery profession remains central to achieving EBP in healthcare settings, mainly in the standardization of healthcare practices and their compatibility with evidence in the healthcare hub (Jun et al., 2016).

Professional development including education or broader programmes, are recognized as effective evidence transfer (Jylhä

et al., 2017). A recent study showed that many maternal and newborn healthcare providers around the world had not received COVID-19 training from their health facilities, and 31% in high-income countries report that they do not have sufficient information to care for a COVID-19 maternity patient; 90% of participants said they have higher stress levels during maternal and newborn care (Semaan et al., 2020). During the COVID-19 Pandemic, the lack of training and trust has negatively affected the quality of care, shortening supplies and increasing the burden on health providers. (Ayenew et al., 2020; UNFPA, 2020). Continuous training programs, application of evidence-based protocols and cooperative initiatives and leadership are crucial to removing the fear of the virus and attaining adequate healthcare inside maternity and child wards, especially in low and middle-income settings. (Costa et al., 2021).

Hospitals implemented strict policies on support people and postpartum accommodation that isolated women during labor and delivery, essentially at the pandemic's start. It is recommended that no visitors or one asymptomatic support person expedited discharge. Hospitals limit the number of people per room and the duration of their stay and reduce postpartum stays. However, this mitigation could negatively impact access to and quality of care (Kotlar et al., 2021).

Some Studies reported that neonatal mortality and stillbirth incidences were significantly higher during the pandemic than before. The previous outcomes may be due to the reallocation of medical resources toward COVID-19 patients and the following reduction in labor management period and perinatal care follow up (Khalil et al., 2020). The increased the risk of Covid -19 transmission, in the healthcare giver, due to the high contact nature of the medical staff, the higher risk individuals who sought for them, and the lack of personal protective types of equipment many hospitals face (Jankowski et al., 2021; WHO, 2021a).

At the general level, infection control practices must be adhered to in the COVID-19 response, which include early identification of the disease, adherence to physical distancing, control of infection sources, timely precautions

and the use of personal protective equipment (PPEs), as well as reduce over-mobility, cleaning and disinfection of work environments and support health care providers (WHO, 2020d).

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 necessary to maintain healthcare providers and provide them with security globally, 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 all possible measures to control the spread of infection for them, first by evaluating the risk factors related to the disease and then taking appropriate measures to reduce these risks (Zhang et al., 2020).

As the pandemic evolves, studies appeared that transmission of covid-19 among health workers has also happened in community settings and health care settings; transmission of COVID-19 infections among health workers may cause a minimizing workforce when they need on the health care system has increased. In addition, infected health workers are at risk of transmitting the SARS-CoV-2 virus to others in households and other community settings (Sikkema et al., 2020; Wilkins et al., 2021).

Egypt's complicated healthcare delivery system, with many healthcare providers working on a part-time basis in more than one medical place, the restriction of resources and the shortage of staff in many of its hospitals would probably add to the challenges of suppressing the disease transmission among health care workers and the community (Gericke et al., 2018). In Egypt (Thabet Mohammed et al., 2020) emphasize the imperious need to educate the health care workers about how to protect themselves against the new pandemic infection.

Significance of the Study:

Just as critically, there are significant concerns regarding the indirect effects of the pandemic on the access and availability of healthcare services, especially for women's

health. Unlike other clinical conditions or elective procedures, obstetric care cannot be postponed, childbirth cannot be rescheduled, and low-resourced settings face a significant challenge in ascertaining proper care (Costa et al., 2021).

Frontline exposure of healthcare workers to 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 worker's commitment to infection prevention control protocols and vaccination against the disease (Matrajt et al., 2021). Therefore, staff development programs regarding infection prevention and control using nursing evidence-based practice regarding the covid -19 pandemic in the obstetrics - gynaecology and paediatrics departments are essential for preventing COVID-19 infections among healthcare workers reducing secondary prevention transmission of disease and updating the policies of infection prevention and control. Furthermore, the present study draws on the recommendations of (WHO's Health Security and Environment Cluster, 2020), which suggests the importance of nursing staff development programs to enhance nurses' Knowledge and practical achievement and their attitudes toward covid-19 in all health settings.

Aim of the Study

The study's main objective is to evaluate the effect of the staff development program on Nursing Evidence-Based performance regarding the Covid -19 pandemic in the obstetrics-gynaecology and paediatrics departments.

Research Hypothesis

1- Nurses who received the staff development program about Covid -19 pandemic had shown good knowledge.

2- Nurses who received the staff development program about Covid -19 pandemic had shown good practice.

3-The attitude of the nurses who will be following the staff development program about the Covid -19 pandemic will be improved.

4- There are strong positive correlations between knowledge, practice, and attitude will show after following the staff development program about Covid -19 pandemic. Materials and Methods

Study design

A quasi-experimental (one group pre-test post-test) design was used.

Settings

This study was carried out in the obstetrics-gynaecology and paediatrics departments which include (Obe & gyne departments, delivery room, pediatric departments and NICU (neonatal intensive care unit). The hospital involved in this study are (Elnaser, port Foad, Elsalam, and Specialized Women and Obstetrics Hospital, Port Said City, Egypt.

Subjects and Sample

A total of 112 nurses working in the departments mentioned earlier, and hospitals that meet the criteria for the sample were collected by the purposive sample from June 2020 to January 2021. One hundred twelve nurses were collected from the departments as the following (37 nurses) from the OBY&GYNE departments, (25 nurses) from the delivery room, 27 from the pediatric ward and 23 from NICU. The criteria for selection include; nurses with at least one year of experience aged from 20- 50 years old. The exclusion criteria are nurses aged less than 20 and more than 50 years and also any nurse who receive previous training on COVID-19.

Tools of Data Collection:

Tool 1: Structured interview questionnaire:

The researchers considered this tool based on an extensive review of relevant scientific literature (WHO, 2020). It includes characteristics of the studied nurses and their job data, such as age, marital status, level of education, Years of experience, the working wards and job descriptions for each nurse (table 1, figures 1&2).

Tool 2: Covid -19 risk assessment for health care workers:- it includes two parts:

First part: Risk assessment tool: The researchers adopted the study tool from the WHO COVID-19 risk assessment tool for healthcare workers (HCWs) (WHO, 2020c). This tool includes four questions (table 2).

Second part: It consists of a questionnaire on the availability of infection prevention resources within the working departments, including 16 items measuring the availability of infection prevention resources Obe & gyne departments, delivery room, internal pediatric wards and NICU (neonatal intensive care unit table 3. For yes and enough answers were scored 3, yes and not enough response was scored as two, and no answer was scored 1. Finally, the scores were calculated in per cent - the number of correct answers multiplied by 60 divided by the total number of items.

Tool 3: This tool assessed the nurses' Knowledge, practice achievement, and attitude regarding COVID-19. The researchers adopted the study tool from (WHO Infection prevention and control during health care when a novel coronavirus (nCoV) infection is suspected) (WHO, 2020a). This tool includes (5) items for nurse knowledge table 4 grading answers is 2 for the correct answer (good), (0) for poor response (wrong or I don't know) and 1 for acceptable. The total knowledge score is classified as good (70%, answers correct), acceptable (50–69%, answers correct), or poor (<50%, answers correct), depending upon the final total score. Student t-test was used to compare the means of the scores, and the Chi-square test was used to assess the significance of the responses; a P-value of < 0.05 was considered statistically significant. For the nurses' practice regarding COVID-19, Table 5. Ten (10) items were considered for measuring the nurses' practice. "always, as recommended", "most of the time", and "rarely". The practice achievement of nurses was scored one if the healthcare worker responded either "always, as recommended" or "most of the time";

otherwise, the nurses' practice was scored zero (rarely). The nurses' attitude questions included ten items measuring nurses' attitudes regarding Covid -19 pandemics. Items in the attitude subsection were also rated on a three-point Likert scale.

Tool 4: the "Nurse Satisfaction tool regarding the program "is the Scoring system: which consists of nine statements. Upon which nurses respond as satisfied, dissatisfied.

COVID-19 booklet:

According to the WHO approach (WHO, 2020b), the researchers prepared and developed the COVID-19 booklet. It consisted of the introduction about the COVID-19, the definition of COVID-19, signs and symptoms, complications, prevention, identification and management of COVID-19. The hygiene measures of COVID-19, regular assessment of risks and effectiveness of control measures, including compliance with infection prevention and control measures and safety protocols. The appropriate use of supplies for infection prevention and control measures, such as hand hygiene supplies and personal protective equipment (medical masks, respirators, eye protection, gloves, gowns), should be available in sufficient quantity and size ranges and meet quality standards (Houghton et al., 2020; WHO, 2020a) (Advice on the use of masks in the context of COVID-19) and World Health Organization (Rational use of personal protective equipment for coronavirus disease (COVID-19) and considerations during severe shortages).

Tools' validity and reliability

The researchers developed data collection tools, and their content validity was tested by a jury of 10 experts in the obstetrics and gynaecology field and the paediatrics and administration nursing field. In contrast, reliability was tested using the test-retest method. The Cronbach's alpha coefficient value of 0.087 for the structured interview questionnaire and 0.86 for the WHO COVID-19 risk assessment tool for healthcare workers (HCWs), 0.089 for the nurses' Knowledge and practice regarding COVID-19 tools indicated good reliability.

Ethical consideration

Before conducting the data collection, ethical approval was obtained from the nursing faculty. Official permission was obtained from the director of each hospital and department after the aim of the study and the program were explained to them. The informed consent of nurses' participation was taken, and they informed that participation was voluntary and that the nurse's confidentiality and privacy would be maintained).

Pilot Study

The questionnaire was pilot-tested with a sample of 10 nurses to assess the study tools for the visibility, clarity, and applicability in collecting the required data and the necessary modification was done. The ten nurses were excluded from the study. Fieldwork

The staff development program intervention was implemented through three phases as the following:

Preparation phase: The researchers reviewed the relevant study literature in this phase. They prepared the tools and the educational materials used to implement the program. The researchers collaborate with nurse administrators to plan training sessions schedule as well as a separate place for interviewing the studied sample.

Implementation phase:

Firstly, the researchers interviewed four nurses per day according to their sequence attendance in the hospital registration book and explained the aim of the study to obtain their oral consent.

Secondly, nurses' practical achievement was assessed using an observational checklist while providing patient care. -Each day, the nurses' practical achievement was assessed from 9 Am to 9 pm.

The researchers divided the sample into 28 nurse groups containing four nurses to follow the Covid-19 social distances protocol. The researchers implemented the program sessions through 12 sessions for each group. The program sessions are implemented through two sessions per week on two different days, for two hours per session. The researchers welcomed the nurses and performed a Covid-19

knowledge and self-care practice pre-test on the first day. Five sessions were held for theoretical learning and seven for the Covid-19 practical part. The researchers used teaching methods for protocol intervention, including lectures, group discussion, role-play brainstorming and demonstration. The training materials involved videos about Covid-19, laptop computers, flip charts, data show presentations and audio-visual aids. Each session comprised an initial hour of educational lecture and nurses-based free discussion and a second hour in which nurses were trained to perform the practical part. The Covid-19 Booklet was given to each participant in the first session.

Evaluation phase: The researchers collected data from nurses' post-test on the last day of the program intervention. The Covid -19 risk assessment for health care workers tools employed preintervention only. The tools of nursing knowledge, practice and attitudes are used pre-intervention and eight weeks post-intervention. The nurses' satisfaction tools were utilized only through eight weeks post-intervention. Also, each participant was given an opportunity to self-report obstacles that prevented their compliance with implementing the staff development program eight weeks post-intervention.

Statistical analysis

The collected data were tabulated and statistically analyzed using an IBM computer and SPSS Advanced Statistics, version 24 (SPSS Inc., Chicago, IL). The following statistical measures were used: Descriptive statistics, including frequency, distribution, mean and standard deviation, were used to describe different characteristics. Kolmogorov – Smirnov test was used to examine the normality of data distribution. Univariate analyses, including the Chi-Square test, Monte Carlo test and Fisher's Exact test, were used to test the significance of the results of qualitative variables. Moreover, the Marginal Homogeneity test and Mac Nemar test were used to test the significance of the paired qualitative variables. The linear correlation was conducted to show a correlation between knowledge, practice and attitude scores among the studied nurses. The researchers considered the observed differences and associations

according to the following: Not significant (NS) $P > 0.05$, Significant (S) $P < 0.05^*$, Highly significant (HS) $P < 0.001^{**}$

Results:

Characteristics of the studied nurses:

Table 1: show that the mean age of the studied nurses was (36.1 ± 6.4) , and the majority of them were married (76.8%). More than one-third of nurses (33.) had a secondary nursing school and bachelor's degree in nursing or postgraduate studies, and 34% had a technical nursing institute. Regarding years of experience, more than half of them (54.5%) had ten years or more of experience. Less than one-fourth of the sample worked in the delivery room (22.3%), paediatrics department (24.1%), NICU (20.5), and more than one third (33,1%) in the Obe&gyne department figure 1. The majority of the sample (79.5%) are bedside nurses, 13.4% are department supervisor assistants, and 7.10 are department supervisors figure 2.

Risk assessment of COVID-19 among the studied Nurses:

Table 2. show the assessment of COVID-19 risk among the studied nurses. The majority of the nurses (65.2%) did not wear personal protective equipment (PPE) when interacting with a COVID-19 patient, which indicates the nurses are in a high-risk situation. Also, more than one-third of nurses did not know if they provided direct care to a confirmed COVID-19 patient or not. And 36% did not know if they contact face to face (within 1 metre) with a confirmed COVID-19 patient in a health care setting. Less than half of them (48.2%) ignore if they contact directly with the environment where the confirmed COVID-19 patient was cared for.

Table 3 shows a lack of non-contagion prevention capabilities within the working departments. Within the working departments. This indicates that they are more at risk of infection with Covid 19. This is evident from the following: 80.4% of the sample said no committee is concerned with preventing Covid 19 in the hospital. In addition, 82.1% of them stated no Manuals for COVID-19 in the department. 90.2% indicate that no PCR tests for Covid-19 are regularly. 80.3% stated that

there is no vaccination against Covid-19. 80.3% indicated that a Face shield or goggles/protective glasses are unavailable. 79.4% said that disposable gowns were not available. 60% stated that there is not enough soap and alcohol to rub hands. Also, 89% of them said there is no means to dry their hands after washing them. 79.4% of them stated that a suitable disinfectant to clean the patient's skin was unavailable. 57% mentioned that Safety boxes available for disposal of acute waste were unavailable. 60% said Protective overheads are unavailable. Also, Medical masks are unavailable (61.5%). Protective gaskets are not enough (45.5%). Gloves nonsterile are unavailable (44.6%). Unavailability of Protective shoes for the foot and a convenient place for patients to maintain social distancing for each of them (89%).

The effect of the staff development program:

Table 4 reveals a marked improvement in nurses' Knowledge of COVID-19 post-implementation of the program compared to pre-intervention. 79.5 % of the studied sample have good Knowledge regarding Covid-19 post implementation of the program, compared to 38.4 % pre-implementation.

Table 5 reveals a marked improvement in nurses' practice of COVID-19 post-implementation of the program compared to pre-intervention. 9.0 % of the studied sample consistently applied practice regarding Covid-19 as recommended post implementation of the program, compared to 2 % pre-implementation. In comparison, 26.0% of them carried out the practice needed for Covid-19 most of the time post-program compared to 4.5% pre-program.

Table 6 shows improvement in nurses' attitudes regarding COVID-19 post-implementation of the program compared to pre-intervention. 28.0 % of the studied sample have a positive attitude regarding Covid-19 post implementation of the program, compared to 17.0 pre-implementation.

Table 7 shows that a highly significant relationship exists between total Knowledge and total attitude level with a total score of practice pre- and post implementation of the program.

Table 8 shows that the studied sample was highly satisfied with the program's implementation regarding Covid-19, as 91% of them were satisfied with the program compared to 9% were dissatisfied.

Table 1: Characteristics of the studied nurses (112)

Characteristics	Studied nurses (n=112)	
	No.	%
Age (years) of the sample		
20-<30	18	16.1
31-<40	58	51.8
40≤	36	32.1
Mean±SD	36.1±6.4	
Marital status:-		
Single	20	17.8
Married	86	76.8
Divorced	3	2.7
widow	3	2.7
Level of Education:-		
Secondary school of nursing	37	33.0
Nursing technical institute	38	34.0
Bachelor's degree in Nursing or postgraduate studies	37	33.0
Years of experience:-		
1-<5	16	14.5
5-<10	35	31.0
10≤	61	54.5
Mean±SD	9.5±3.4	

Figure 1. Distribution of the nurses according to the working departments.

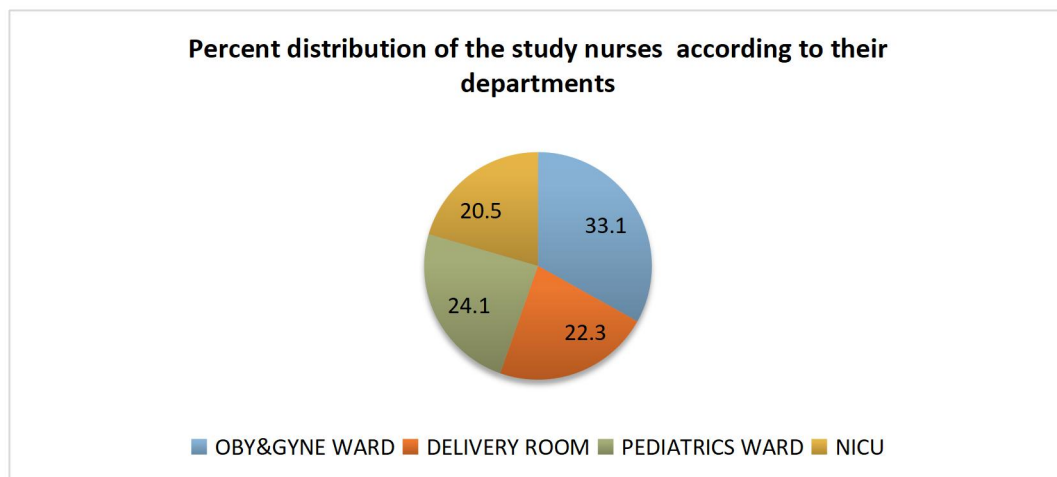


Figure 2. Distribution of the study nurses according to their job role (112).

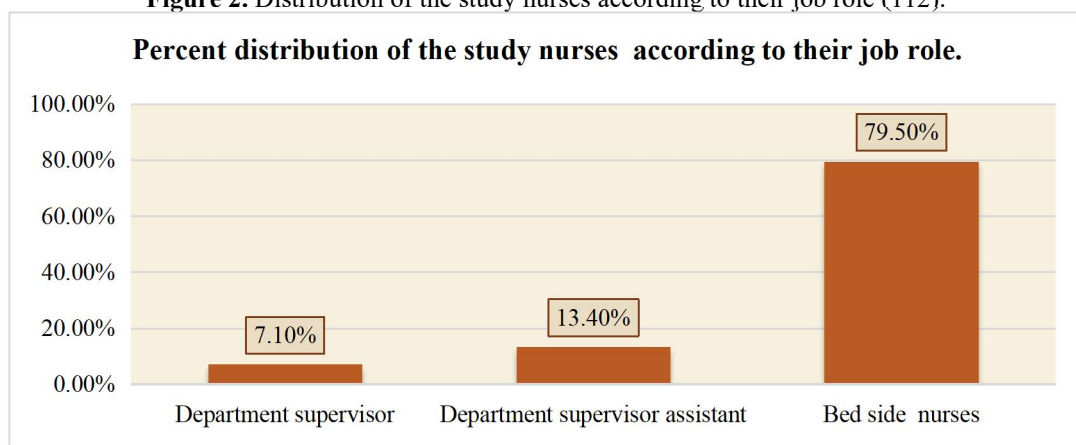


Table 2: Risk assessment of COVID-19 among the studied nurses (112)

Variables	Studied nurses (n=112)	
	No.	%
Did you provide direct care to a confirmed COVID-19 patient?		
Yes	18	16.1
No	58	51.8
Unknown	36	32.1
Did you have face-to-face contact (within 1 metre) with a confirmed COVID-19 patient in a health care setting?		
Yes	20	18.0
No	52	46
Unknown	40	36
Did you directly contact the environment where the confirmed COVID-19 patient was cared for? E.g. bed, linen, medical equipment, bathroom etc		
Yes	37	33.0
No	21	18.8
Unknown	54	48.2
While you interact with a COVID-19 patient wearing personal protective equipment (PPE)?		
Yes	39	34.8
No	73	65.2

Table 3. Distribution of the availability of non-contagion prevention capabilities within the working departments.

Infection prevention resources	None		Yes/not enough		Yes/enough	
	No.	%	No.	%	No.	%
Presence of the Infection Prevention and Control Committee	90	80.4	7	6.20	15	13.4
Manuals in the unit on COVID-19 prevention methods	92	82.1	7	6.3	13	11.6
PCR tests regularly	101	90.2	9	8.0	2	1.8
Vaccinations regarding COVID-19 control and prevention are available for hospital staff	90	80.3	10	9	12	10.7
Face shield or goggles/protective glasses are available for hospital staff	90	80.3	12	10.7	10	9
Disposable gowns are available	89	79.4	10	9	13	11.6
Enough soap and alcohol to rub hands	67	60	36	32	9	8
Means or materials to dry the hands after washing them	100	89	2	2	10	9
A suitable disinfectant to clean the skin of the patient	89	79.4	13	11.6	10	9
Safety boxes available for disposal of acute waste	64	57	28	25	20	18.
Protective Overhead are available	67	60	30	26.7	15	13.4
Medical masks are available	69	61.5	14	12.5	29	26
Protective gaskets are available	65	31.8	22	45.5	25	22.7
Gloves nonsterile are available	50	44.6	38	34	24	21.4
Protective shoes for the foot are available	100	89	10	9	2	2
A convenient place for patients to maintain social distancing	100	89	10	9	2	2
Have you had enough time for systematic training and practice?	100	89	2	2	10	9
Access to laboratory diagnostic tests	90	80.3	10	9	12	10.7
Possibility to test any suspected case of COVID-19	67	60	36	32	9	8
Referral obstetric unit for COVID-19 cases	89	79.4	13	11.6	10	9
Possible to order a test for COVID-19 for maternity patients	89	79.4	13	11.6	10	9
Screening for COVID-19 symptoms among maternity patients	89	79.4	13	11.6	10	9
Reserved isolation rooms for suspected cases	89	79.4	13	11.6	10	9
Level of knowing how to provide care for a woman and child with COVID-19	50	44.6	38	34	24	21.4
Facility published materials covering COVID-19 targeted towards pregnant, laboring or postnatal women and child	89	79.4	13	11.6	10	9

Table 4. The Knowledge of the studied nurses before and after the implementation of the staff development program (112)

Knowledge about COVID-19		Before implementation of the staff development program(112)		After implementation of the staff development program (112)		Significance
		No.	%	No.	%	
Nature of COVID-19	Poor	46	41.0	30	26.8	MH=2.111 P=0.035*
	Acceptable	34	30.4	50	44.6	
	Good	32	28.6	32	28.6	
Manifestation of COVID-19	Poor	25	22.3	1	0.9	MH=7.220 P<0.0001*
	Acceptable	44	39.3	22	19.6	
	Good	43	38.4	89	79.5	
Mode of transmission of covid-19	Poor	36	32.1	9	8.0	MH=4.849 P<0.0001*
	Acceptable	72	64.3	95	84.8	
	Good	4	3.6	8	7.2	
Prevention of COVID-19	Poor	39	34.8	10	8.9	MH=5.013 P<0.0001*
	Acceptable	64	57.2	76	67.9	
	Good	9	8.0	26	23.2	
Role of the nurse for COVID-19 management.	Poor	75	67.0	22	19.6	MH=7.660 P<0.0001*
	Acceptable	28	25.0	44	39.3	
	Good	9	8.0	46	41.1	
Total knowledge level	Poor	25	22.3	1	0.9	MH=7.220 P<0.0001*
	Acceptable	44	39.3	22	19.6	
	Good	43	38.4	89	79.5	

MH: Marginal Homogeneity test Standard value, MNP: P-value for Mc Nemar test *significant at $P<0.05$.

Table 5. The practice of studied nurses before and after the implementation of the staff development program (112)

Practice		Before implementation of the staff development program		After implementation of the staff development program		Significance
		No.	%	No.	%	
Perform Hand washing before and after touching the COVID-19 patient	Rarely	36	32.1	9	8.0	MH=4.849 P<0.0001*
	Most of the time	72	64.3	95	84.8	
	Always, as recommended	4	3.6	8	7.2	
Single-use gloves during you interact with a COVID-19 patient	Rarely	39	34.8	10	8.9	MH=5.013 P<0.0001*
	Most of the time	64	57.2	76	67.9	
	Always, as recommended	9	8.0	26	23.2	
Use a Medical mask while you interact with a COVID-19 patient	Rarely	39	34.8	10	8.9	MH=5.013 P<0.0001*
	Most of the time	64	57.2	76	67.9	
	Always, as recommended	9	8.0	26	23.2	
Use Face shield or goggles/protective glasses during you interact with a COVID-19 patient	Rarely	46	41.0	30	26.8	MH=2.111 P=0.035*
	Most of the time	34	30.4	50	44.6	
	Always, as recommended	32	28.6	32	28.6	
Use a Disposable gown while you interact with a COVID-19 patient	Rarely	46	41.0	30	26.8	MH=2.111 P=0.035*
	Most of the time	34	30.4	50	44.6	
	Always, as recommended	32	28.6	32	28.6	
Did you remove and replace your PPE	Rarely	36	32.1	9	8.0	MH=4.849 P<0.0001*
	Most of the time	72	64.3	95	84.8	

Practice		Before implementation of the staff development program		After implementation of the staff development program		Significance
		No.	%	No.	%	
according to protocol While you interact with the COVID-19 patient (e.g. when the medical mask became wet, disposed of the wet PPE in the waste bin, performed hand hygiene)	Always, as recommended	4	3.6	8	7.2	
Did you perform hand hygiene before and after any clean or aseptic procedure was performed	Rarely	39	34.8	10	8.9	MH=5.013 P<0.0001*
	Most of the time	64	57.2	76	67.9	
	Always, as recommended	9	8.0	26	23.2	
Did you perform hand hygiene after exposure to the patient's body fluid	Rarely	75	67.0	22	19.6	MH=7.660 P<0.0001*
	Most of the time	28	25.0	44	39.3	
	Always, as recommended	9	8.0	46	41.1	
Did you perform hand hygiene after touching the patient's surroundings (bed, door handle, etc.), regardless of whether you were wearing gloves?	Rarely	75	67.0	22	19.6	MH=7.660 P<0.0001*
	Most of the time	28	25.0	44	39.3	
	Always, as recommended	9	8.0	46	41.1	
During your interaction with the COVID-19 patient, where high-Touch surfaces decontaminated frequently (at least three times daily)?	Rarely	36	32.1	9	8.0	MH=4.849 P<0.0001*
	Most of the time	72	64.3	95	84.8	
	Always, as recommended	4	3.6	8	7.2	
Total practice score	Rarely	105	93.7	73	65.0	MH=5.555 P=0.003*
	Most of the time	5	4.5	29	26.0	
	Always, as recommended	2	1.8	10	9.0	

Table 6. The attitude of the nurses regarding covid-19 before and after the implementation of the staff development program (112)

Scores		Before induction of guidelines		After induction of guidelines		Significance
		No.	%	No.	%	
Attitude						
Attitude level	Negative	93	83.0	81	72.0	MNP=0.002*
	Positive	19	17.0	31	28.0	

Table 7. Correlations between knowledge scores, attitude and practice before and after the implementation of the staff development program (112)

Scores		Knowledge		Practice		Attitude	
		r	P	r	P	r	P
Before the program intervention	Total Score of Knowledge	-	-	0.307	0.001*	0.206	0.030*
	Total Score of Practice	0.307	0.001*	-	-	0.546	<0.0001*
	Total Score of Attitude	0.206	0.030*	0.546	<0.0001*	-	-
After the program intervention	Total Score of Knowledge	-	-	0.207	0.031*	0.546	<0.0001*
	Total Score of Practice	0.170	0.074	-	-	0.323	0.001*
	Total Score of Attitude	0.011	0.901	0.323	0.001*	-	-

r: Pearson Correlation Coefficient, *significant at $P \leq 0.05$.

Table (8): The distribution of the nurses' satisfaction regarding the implementation of the staff development program (112)

Items	Satisfied		dissatisfied	
	N	%	N	%
The program sessions corrected misconceptions related to COVID-19	100	89	12	11
The language of the program sessions was clear, easy to understand, and efficient.	90	80.3	22	19.7
The aim of the program sessions corresponded with its content.	67	60	45	40
The place of implementing program sessions were well ventilated and lighting and comfortable.	89	79.4	32	20.6
The number of participants for each session was appropriate for the program implementation, and social distance was maintained.	112	100	0	00
The implemented program sessions contribute to the development and updating of individual 'information regarding COVID-19	90	80.3	22	19.7
The session schedule did not interfere with the time of hospital duties.	112	100	0	00
The educational program sessions were recommended to be replicated in other health settings and other places in the future.	89	79.4	32	20.6
The program's teaching methods and media supported the learning process.	100	89	12	11
Total satisfaction score	102	91	10	9

Discussion:

Health workers who interact with and care for COVID-19 patients are at greater risk of infection. Therefore, reducing and controlling these risks is very important to protect health workers and limit the spread of COVID-19. According to what has been explained in the scientific evidence, the use of personal protective equipment in an appropriate manner, proper hand hygiene, and constant wearing of a mask in health care institutions, in addition to continuous training and education,

and the development of appropriate educational programs to combat infection have a fundamental role in reducing the risk of the spread of COVID-19 disease. Among workers in the health sector (WHO, 2020c). There are limitations in obtaining comprehensive data regarding health worker infection with Covid 19 in community settings and health care settings due to the lack of published data among health workers (Core Competencies for Infection Prevention and Control Professionals (WHO, 2020a).

In the field of obstetrics. The maternity staff must be prepared to adapt to ensure the safety of the obstetric environment while using evidence-based standards to meet the new challenges brought about by the Covid-19 pandemic. Health care for pregnant women, childbirth, breastfeeding and child cannot be postponed, unlike routine medical treatment. Even in the Covid-19 crisis, which requires social distancing, obstetric workers faced enormous challenges and abandoned the prevailing standards for providing care under these circumstances (Bhaga, 2010) stated that nurses' education and training development are essential. Moreover, nurses must be encouraged to join staff development and retention programs in all health settings (Schmitt et al., 2021). An exposure management system based on risk assessment should be developed to enhance and support health workers reporting occupational and non-occupational exposure to or symptoms of COVID-19 (WHO, 2020c). According to the risk assessment of COVID-19 among the studied sample, the nursing sample is a high-risk exposure to infection with Covid 19 at the workplace. (WHO, 2021b), as most nurses (65.2%) did not wear personal protective equipment (PPE) when interacting with a COVI-19 patient. Also, more than one-third of nurses did not know if they provided direct care to a confirmed COVID-19 patient. And 36% did not know if they contact face to face (within 1 metre) with a confirmed COVID-19 patient in a health care setting. Less than half of them (48.2%) ignore if they contact directly with the environment where the verified COVID-19 patient was cared for(E.g. bed, linen, medical equipment, bathroom. This result can be traced back to a lack of infection prevention resources within the working departments, as shown in table 3.

According to WHO recommendations, health workers with high-risk exposure should be tested for SARS-CoV-2 (WHO, 2020c). Additional laboratory testing for SARS-CoV-2 infections is another element needed to identify SARS-CoV-2 transmission among health workers; in health settings with limited resources for infection prevention, WHO recommends that health workers be prioritized for testing, regardless of whether they are in

contact with a confirmed case of Covid-19(to protect health workers and reduce the risk of covid-19 transmission) (WHO, 2020a). According to the present study results, 90.2% of the nurses indicated that no PCR tests for Covid-19 are regularly.

It is reported that proper equipment for personal protection, best practices of hand hygiene, following the universal policies of masking in healthcare resources, and adequate training for infection prevention control (IPC) and proper education for all health workers are linked with limited the risk of infection transmission among the health workers (Chou et al., 2020). In the present study results, 80.4% of the sample said no committee is concerned with preventing Covid 19 in the hospital. In addition, 82.1% of them stated no Manuals for COVID-19 in the department. 80.3% stated that there is no vaccination against Covid-19. 80.3% indicated that a Face shield or goggles/protective glasses are unavailable. 79.4% said that disposable gowns were not available. 60% stated that there is not enough soap and alcohol to rub hands. Also, 89% of them said there is no means to dry their hands after washing them. 79.4% of them stated that a suitable disinfectant to clean the patient's skin was unavailable. 57% mentioned that Safety boxes available for disposal of acute waste were unavailable. 60% said protective overheads are unavailable. Also, medical masks are unavailable (61.5%). Protective gaskets are not enough (45.5%). Gloves nonsterile are unavailable (44.6%). Unavailability of Protective shoes for the foot and a convenient place for patients to maintain social distancing for each of them (89%). The results of this study are consistent with the results of previous studies in Egypt and other countries related to COVID-19 (Ahmed et al., 2020; Boškoski et al., 2020; Centers for Disease Control and Prevention, 2020; El-Sokkary et al., 2021; Mandrola, 2020; Perkins et al., 2020). They all reported that the supplies and equipment required to combat COVID-19 are limited and insufficient, besides the extensive use of personal protective equipment in health institutions.

As shown in the current results, a significant restriction in many health settings is the limited availability of testing for SARS-

CoV-2 and, when available, the delayed results. This has a remarkable impact on pregnancy and childbirth because of the required follow-up and assessment of mother and fetus and the decision on the delivery time, and the proper using the protective equipment necessary for a safe childbirth procedure, including the neonate and the health team (Costa et al., 2021).

In the present study results, a marked improvement in nurses' Knowledge of COVID-19 post-implementation of the program compared to pre-intervention. 79.5 % of the studied sample have good Knowledge regarding Covid-19 post implementation of the program, compared to 38.4 % pre-implementation. The results of (Arafat M et al., 2018) support the present study results, as 80.0 % of the nurses have good Knowledge regarding nosocomial infection post implementation of the program, compared to 38.2 % pre-implementation. The lack of nurses' Knowledge was because the hospital administration did not provide them with any refreshments and training programs on their performance regarding the pandemic disease nor provide them with care standards for Covid-19. Covid -19 manuals help in guiding their action. Of course, this lack of Knowledge, of course, results in poor quality nursing performance and then transmission of infection. In this respect, Chou et al., 2020 stated that the availability of staff development program with a specialist and trained team should be supported by the administrative and management personnel.

There is a substantial gap between the theoretical and practical parts of the nursing field. The nurses pay more attention to practical and skill aspects than the Knowledge and science of nursing (Rahimi, 2018). In the current study, there is a marked improvement in nurses' practice of COVID-19 post-implementation of the program compared to pre-intervention. 9.0 % of the studied sample consistently applied practice regarding Covid-19 as recommended post implementation of the program, compared to 2 % pre-implementation. In comparison, 26.0% of them carried out the practice needed for Covid-19 most of the time post-program compared to 4.5% post program. The present study results

are consistent with the outcome of (Arafat M et al., 2018; Elkashif et al., 2021).

Most importantly, inadequate training on hand hygiene and poor commitment to infection prevention control (IPC) were significant predictors of COVID-19 (El-Sokkary et al., 2021). Although Egypt has had a successful national infection prevention control (IPC) program for more than twenty years (Talaat et al., 2006), there is still an inadequate commitment to infection prevention control (IPC) and hand hygiene practices (Yousef et al., 2020). Specific measures should take place on national and facility levels to improve infection prevention control (IPC) practices, screen all healthcare workers for clinical signs of COVID-19 at the start of each shift to exclude healthcare workers from work when infected, and prevent healthcare workers with comorbidities working in high-risk places. Rigorous implementation of infection prevention control (IPC) training should be prioritized with the enforcement of infection prevention control (IPC) teams (El-Sokkary et al., 2021). In this respect, the present study result shows an improvement in nurses' attitudes regarding COVID-19 post-implementation of the program compared to pre-intervention. 28.0 % of the studied sample have a positive attitude regarding Covid-19 post implementation of the program, compared to 17.0 pre-implementation. Also, it concludes that a solid significant relationship exists between total Knowledge and total attitude level with a total score of practice pre- and post-intervention of the program. Hence, the studied sample was highly satisfied with the program's implementation regarding Covid-19, as 91% of them were satisfied with the program compared to 9% who were dissatisfied.

The findings in the current study are in line with previous reports on COVID-19. Nurse has not had enough time for systematic training and practice (Garralda Fernandez et al., 2021; WHO, 2020c). Professional and management supervision and guidance, as well as instructing mechanisms, were lacking. Lacking personal protective equipment triggered the magnitude of the Covid -19 problem (WHO, 2020c). Hence, healthcare leaders and managers should appreciate different means of training on infection prevention control (IPC) measures,

mainly the practice of hand hygiene and personal protective equipment use. Using all means of training methods such as Online training courses and mobile applications may help in this situation. (WHO, 2006) reported that inadequate Knowledge, skills, and inappropriate attitudes can all form barriers to good health care workers. So, advances in insights into treatment and diagnosis and changes in roles and responsibilities require continuous professional development among health workers. Nursing staff must develop a lifelong learning process at the start of a professional career in the health sector.

Conclusion:

Translating evidence into practice during a Covid-19 pandemic to establishing a staff development program is the best possible provision of healthcare and guaranteeing preventive measures to patients and healthcare providers and is critical in facing Covid-19 and working in the complete chain of health care. This is evident from a marked improvement in nurses' Knowledge of COVID-19 post-implementation of the program compared to pre-intervention. 79.5 % of the studied sample have good Knowledge regarding Covid-19 post implementation of the program, compared to 38.4 % pre-implementation. Also, 26.0% of them carried out the practice needed for Covid-19 most of the time post-program compared to 4.5% post program, and 28.0 % of the studied sample had a positive attitude regarding Covid-19 post implementation program, compared to 17.0 pre-implementation. Moreover, 91% of them were satisfied with the program compared to 9% dissatisfied.

Recommendations:

Based on the finding of the present study, the following are recommended:

The staff development program on Nursing Evidence-Based performance about the Covid -19 pandemic should be accessible and persistently provided to nurses in all health settings to improve their performance and lower the risk covid-19.

The present study on the staff development program on Nursing Evidence-

Based performance related to Covid -19 pandemic can be replicated in another health setting with a comprehensive sample.

Further studies are needed to investigate the impact of Covid 19 on the quality of life of nurses in obstetrics, gynaecology and pediatric departments.

The preventive measures should be followed in the health setting to improve infection prevention control practices, include screen all health care professionals for clinical signs of COVID-19 at the start of each shift and excluding the suspected staff from working in high-risk areas.

Strict implementation of infection prevention control training programs in all health settings in Egypt.

The COVID-19 booklet used in this study can be implemented in its current form or other advanced and more developed versions for nursing performance and prevention regarding Covid-19 and other pandemic infections.

References:

- Ahmed, J., Malik, F., Bin Arif, T., Majid, Z., Chaudhary, M. A., Ahmad, J., Malik, M., Khan, T. M., & Khalid, M. (2020). Availability of Personal Protective Equipment (PPE) Among US and Pakistani Doctors in COVID-19 Pandemic. *Cureus*, 12(6), e8550. <https://doi.org/10.7759/CUREUS.8550>
- Arafat M, Yahia Mahdy, A., & M. L. El-Kashif, M. (2018). The Effect of Evidence-Based Guidelines on Nurses, Performance in Respect to Nosocomial Infection at Medical-Surgical and Obstetrician Departments. *American Journal of Nursing Research*, 6(6), 507–514. <https://doi.org/10.12691/ajnr-6-6-19>
- Aranega-Bou, P., George, R. P., Verlander, N. Q., Paton, S., Bennett, A., Moore, G., Aiken, Z., Akinremi, O., Ali, A., Cawthorne, J., Cleary, P., Crook, D. W., Decraene, V., Dodgson, A., Doumith, M., Ellington, M., Eyre, D. W., George, R. P., Grimshaw, J., ... Woodford, N. (2019). Carbapenem-resistant Enterobacteriaceae

- dispersal from sinks is linked to drain position and drainage rates in a laboratory model system. *Journal of Hospital Infection*, 102(1), 63–69. <https://doi.org/10.1016/j.jhin.2018.12.007>
- Aynew, B., Pandey, D., Yitayew, M., Etana, D., Pandey, B. K., Verma, N., & Gashaw, Y. (2020). Risk for Surge Maternal Mortality and Morbidity during the Ongoing Corona Virus Pandemic. *MedLife Clinics*, 2(June), 1012.
- Bhaga, T. (2010). THE IMPACT OF WORKING CONDITIONS ON THE PRODUCTIVITY OF NURSING STAFF IN THE MIDWIFE OBSTETRICAL UNIT OF PRETORIA WEST HOSPITAL by TARAMATI BHAGA Submitted in partial fulfillment of the requirements for the degree MSW (EAP) At the Department of Social Wor. <https://repository.up.ac.za/handle/2263/27211>
- Boškoski, I., Gallo, C., Wallace, M. B., & Costamagna, G. (2020). COVID-19 pandemic and personal protective equipment shortage: protective efficacy comparing masks and scientific methods for respirator reuse. *Gastrointestinal Endoscopy*, 92(3), 519–523. <https://doi.org/10.1016/j.gie.2020.04.048>
- Centers for Disease Control and Prevention. (2020). Optimizing Personal Protective Equipment (PPE) Supplies. Center for Disease Control. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html>
- Chou, R., Dana, T., Buckley, D. I., Selph, S., Fu, R., & Totten, A. M. (2020). Epidemiology of and Risk Factors for Coronavirus Infection in Health Care Workers; A Living Rapid Review. In *Annals of Internal Medicine* (Vol. 173, Issue 2, pp. 120–136). *Ann Intern Med*. <https://doi.org/10.7326/M20-1632>
- Costa, M. L., Souza, R. T., Pacagnella, R. C., Bento, S. F., Ribeiro-Do-Valle, C. C., Luz, A. G. Q., Lajos, G. J., Nobrega, G. M., Griggio, T. B., Charles, C. M., Tedesco, R. P., Fernandes, K. G., Martins-Costa, S. H. A., Peret, F. J. A., Feitosa, F. E., Mattar, R., Cunha Filho, E. V., Vettorazzi, J., Haddad, S. M., ... Cecatti, J. G. (2021). Facing the COVID-19 pandemic inside maternities in Brazil: A mixed-method study within the REBRACO initiative. *PLoS ONE*, 16(7 July), e0254977. <https://doi.org/10.1371/journal.pone.0254977>
- El-Sokkary, R. H., El-Kholy, A., Eldin, S. M., Khater, W. S., Gad, D. M., Bahgat, S., Negm, E. E. M., Kholy, J. A. El, Mowafy, S., Mahmoud, E., & Mortada, E. M. (2021). Characteristics and predicting factors of Corona Virus Disease-2019 (COVID-19) among healthcare providers in a developing country. *PLoS ONE*, 16(January 1). <https://doi.org/10.1371/journal.pone.0245672>
- Elkashif, M. M. L., Mahdy, A. Y., & Elgazzar, S. E. (2021). Evaluating The Effect of Establishing Protocol for Self-Care Practice of Diabetic Foot Patients Regarding Their Needs, Concerns and Medication Use: A quasi-experimental study. *Saudi Journal of Biological Sciences*, 28(6), 3343–3350. <https://doi.org/10.1016/j.sjbs.2021.02.081>
- Garralda Fernandez, J., Molero Vilches, I., Bermejo Rodríguez, A., Cano Torres, I., Colino Romay, E. I., García Arata, I., Jaqueti Aroca, J., Lillo Rodríguez, R., López Lacomba, D., Mazón Cuadrado, L., Molina Esteban, L., Morales García, L. J., Moratilla Monzo, L., Nieto-Borrajo, E., Pacheco Delgado, M., Prieto Menchero, S., Sánchez Hernández, C., Sánchez Testillano, E., & García-Martínez, J. (2021). Impact of SARS-CoV-2 pandemic among health care workers in a secondary teaching hospital in Spain. *PloS One*, 16(1), e0245001. <https://doi.org/10.1371/journal.pone.0245001>
- Gericke, C. A., Britain, K., Elmahdawy, M., & Elsis, G. (2018). Health System in Egypt. In *Health services research* (pp. 1–18). Springer, New York, NY. https://doi.org/10.1007/978-1-4614-6419-8_7-1
- Houghton, C., Meskell, P., Delaney, H., Smalle, M., Glenton, C., Booth, A., Chan, X. H. S., Devane, D., & Biesty, L. M.

- (2020). Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: A rapid qualitative evidence synthesis. In *Cochrane Database of Systematic Reviews* (Vol. 4, Issue 4, pp. 1–55). *Cochrane Database Syst Rev*. <https://doi.org/10.1002/14651858.CD013582>
- Jankowski, J., English, P., Friedman, E., McKeown, H., Rao, M., Sethi, S., & Strain, W. D. (2021). Risk Stratification tool for Healthcare workers during the CoViD-19 Pandemic; using published data on demographics, co-morbid disease and clinical domain in order to assign biological risk. *Medrxiv*, 2005–2020. <https://doi.org/10.1101/2020.05.05.20091967>
- Jun, J., Kovner, C. T., & Stimpfel, A. W. (2016). Barriers and facilitators of nurses' use of clinical practice guidelines: An integrative review. In *International Journal of Nursing Studies* (Vol. 60, pp. 54–68). *Int J Nurs Stud*. <https://doi.org/10.1016/j.ijnurstu.2016.03.006>
- Jylhä, V., Oikarainen, A., Perälä, M.-L., & Holopainen, A. (2017). Facilitating evidence-based practice in nursing and midwifery in the WHO European Region. *World Health Organization*, 1–34. <http://www.euro.who.int/pubrequest>
- Khalil, A., Von Dadelszen, P., Draycott, T., Ugwumadu, A., O'Brien, P., & Magee, L. (2020). Change in the Incidence of Stillbirth and Preterm Delivery during the COVID-19 Pandemic. In *JAMA - Journal of the American Medical Association* (Vol. 324, Issue 7, pp. 705–706). American Medical Association. <https://doi.org/10.1001/jama.2020.12746>
- Kotlar, B., Gerson, E., Petrillo, S., Langer, A., & Tiemeier, H. (2021). The impact of the COVID-19 pandemic on maternal and perinatal health: a scoping review. In *Reproductive Health* (Vol. 18, Issue 1, pp. 1–39). *BioMed Central Ltd*. <https://doi.org/10.1186/s12978-021-01070-6>
- Mandrola, J. (2020). COVID-19 and PPE: Some of us will die because of the shortage. *Recenti Progressi in Medicina*, 111(4), 183. <https://doi.org/10.1701/3347.33175>
- Matrajt, L., Eaton, J., Leung, T., & Brown, E. R. (2021). Vaccine optimization for COVID-19: Who to vaccinate first? *Science Advances*, 7(6). <https://doi.org/10.1126/sciadv.abf1374>
- Melnyk, B. M., Fineout-Overholt, E., Gallagher-Ford, L., & Kaplan, L. (2012). The state of evidence-based practice in US nurses: Critical implications for nurse leaders and educators. *Journal of Nursing Administration*, 42(9), 410–417. <https://doi.org/10.1097/NNA.0b013e3182664e0a>
- Perkins, D. J., Villescas, S., Wu, T. H., Muller, T., Bradfute, S., Hurwitz, I., Cheng, Q., Wilcox, H., Weiss, M., Bartlett, C., Langsjoen, J., & Seidenberg, P. (2020). COVID-19 global pandemic planning: Decontamination and reuse processes for N95 respirators. *Experimental Biology and Medicine*, 245(11), 933–939. <https://doi.org/10.1177/1535370220925768>
- Rahimi, et al. (2018). Impact of Training on Nurses Performance and Productivity at Neonatal Intensive Care Unit (NICU). *JOJ Nursing & Health Care*, 9(2). <https://doi.org/10.19080/jojnhc.2018.09.555758>
- Rhee, C., Baker, M. A., & Klompas, M. (2020). The COVID-19 infection control arms race. In *Infection Control and Hospital Epidemiology* (Vol. 41, Issue 11, pp. 1323–1325). Cambridge University Press. <https://doi.org/10.1017/ice.2020.211>
- Schmitt, N., Mattern, E., Cignacco, E., Seliger, G., König-Bachmann, M., Striebich, S., & Ayerle, G. M. (2021). Effects of the Covid-19 pandemic on maternity staff in 2020 – a scoping review. *BMC Health Services Research*, 21(1), 1–25. <https://doi.org/10.1186/s12913-021-07377-1>

- Semaan, A., Audet, C., Huysmans, E., Afolabi, B., Assarag, B., Banke-Thomas, A., Blencowe, H., Caluwaerts, S., Campbell, O. M. R., Cavallaro, F. L., Chavane, L., Day, L. T., Delamou, A., Delvaux, T., Graham, W. J., Gon, G., Kascak, P., Matsui, M., Moxon, S., ... Benova, L. (2020). Voices from the frontline: Findings from a thematic analysis of a rapid online global survey of maternal and newborn health professionals facing the COVID-19 pandemic. *BMJ Global Health*, 5(6). [https:// doi. org/ 10. 1136/ bmjgh- 2020-002967](https://doi.org/10.1136/bmjgh-2020-002967)
- Shifaza, F., Evans, D., & Bradley, H. (2014). Nurses' Perceptions of Barriers and Facilitators to Implement EBP in the Maldives. *Advances in Nursing*, 2014, 1–7. <https://doi.org/10.1155/2014/698604>
- Sikkema, R. S., Pas, S. D., Nieuwenhuijse, D. F., O'Toole, A., Verweij, J. J., van der Linden, A., Chestakova, I., Schapendonk, C., Pronk, M., Lexmond, P., Bestebroer, T., Overmars, R. J., van Nieuwkoop, S., van den Bijllaardt, W., Bentvelsen, R. G., van Rijen, M. M. L., Buiting, A. G. M., van Oudheusden, A. J. G., Diederren, B. M., ... Koopmans, M. P. G. (2020). COVID-19 in health-care workers in three hospitals in the south of the Netherlands: a cross-sectional study. *The Lancet Infectious Diseases*, 20(11), 1273–1280. [https://doi.org/10.1016/S1473-3099\(20\)30527-2](https://doi.org/10.1016/S1473-3099(20)30527-2)
- Talaat, M., Kandeel, A., Rasslan, O., Hajjeh, R., Hallaj, Z., El-Sayed, N., & Mahoney, F. J. (2006). Evolution of infection control in Egypt: Achievements and challenges. *American Journal of Infection Control*, 34(4), 193–200. [https:// doi. org/ 10. 1016/ j. ajic. 2005. 05. 028](https://doi.org/10.1016/j.ajic.2005.05.028)
- Thabet Mohammed, G., Mohammed Hassan, A., Shawkat Abo Elmagd, N., Mohamed Gamal, N., Mohammed MohammedSaleh, Z., & Sayed Khalil, S. (2020). COVID-19: Knowledge, Perception and Infection Control Practice of Health Care Workers (A Suggested Ward-based Educational Package). *Assiut Scientific Nursing Journal*, 8(222), 175–187. <http:// asnj. journals. ekb. eghttp// www. arabimpactfactor. com>
- UNFPA. (2020). Impact of the COVID-19 Pandemic on Family Planning and Ending Gender-based Violence, Female Genital Mutilation and Child Marriage. Interim Technical Note, April, 7. https://www.unfpa.org/sites/default/files/resource-pdf/COVID-19_impact_brief_for_UNFPA_24_April_2020_1.pdf
- Wang, X., Ferro, E. G., Zhou, G., Hashimoto, D., & Bhatt, D. L. (2020). Association between Universal Masking in a Health Care System and SARS-CoV-2 Positivity among Health Care Workers. In *JAMA - Journal of the American Medical Association* (Vol. 324, Issue 7, pp. 703–704). *JAMA*. <https://doi.org/10.1001/jama.2020.12897>
- WHO. Health Security and Environment Cluster. (2020). Shortage of personal protective equipment endangering health workers worldwide. In *World Health Organization* (Issue March, pp. 1–3). <https://www.who.int/news/item/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide>
- WHO. (2006). The World Health Report 2006: Working together for health. In *Education for Health: Change in Learning and Practice* (Vol. 19, Issue 3, pp. 385–387). <https://doi.org/10.1080/13576280600937911>
- WHO. (2019). WHO EMRO | Update on COVID-19 in the Eastern Mediterranean Region | News | Media centre. WHO. <http://www.emro.who.int/media/news/update-on-covid-19-in-the-eastern-mediterranean-region.html>
- WHO. (2020a). Infection prevention and control guidance for long-term care facilities in the context of COVID-19: interim guidance, March 21 2020. INTERIUM GUIDENCE. [https:// apps. who. int/ iris/handle/10665/331508](https://apps.who.int/iris/handle/10665/331508)

- WHO. (2020b). Prevention, identification and management of health worker infection in the context of COVID-19. World Health Organisation Interim Guidance, October 30 2020, 1–6. [https:// www. who. int/ publications/i/item/10665-336265](https://www.who.int/publications/i/item/10665-336265)
- WHO. (2020c). Risk assessment and management of exposure of health care workers in the context of COVID-19: interim guidance. Interim Guidance. <https://www.who.int/publications/i/item/risk-assessment-and-management-of-exposure-of-health-care-workers-in-the-context-of-covid-19-interim-guidance>
- WHO. (2020d). WHO Director-General's opening remarks at the media briefing on COVID-19 - March 11 2020. WHO Director General's Speeches, March, 4. <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
- WHO. (2021a). Infection prevention and control guidance for long-term care facilities in the context of COVID-19: interim guidance, January 8 2021 (Issue WHO/2019-nCoV/IPC_long_term_care/2021.1). [https:// apps. who. int/ iris/ handle/ 10665/331508](https://apps.who.int/iris/handle/10665/331508)
- WHO. (2021b). The impact of COVID-19 on health and care workers: a closer look at deaths. In WHO (Vol. 1).
- Wilkins, J. T., Gray, E. L., Wallia, A., Hirschhorn, L. R., Zembower, T. R., Ho, J., Kalume, N., Agbo, O., Zhu, A., Rasmussen-Torvik, L. J., Khan, S. S., Carnethon, M., Huffman, M., & Evans, C. T. (2021). Seroprevalence and Correlates of SARS-CoV-2 Antibodies in Health Care Workers in Chicago. *Open Forum Infectious Diseases*, 8(1). [https:// doi. org/ 10. 1093/ ofid/ofaa582](https://doi.org/10.1093/ofid/ofaa582)
- Yousef, R. H. A., Salem, M. R., & Mahmoud, A. T. (2020). Impact of implementation of a modified World Health Organization multimodal hand hygiene strategy in a university teaching hospital. *American Journal of Infection Control*, 48(3), 249–254. [https:// doi. org/ 10. 1016/ j. ajic. 2019.07.019](https://doi.org/10.1016/j.ajic.2019.07.019)
- Zhang, M., Zhou, M., Tang, F., Wang, Y., Nie, H., Zhang, L., & You, G. (2020). Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *Journal of Hospital Infection*, 105(2), 183–187. <https://doi.org/10.1016/j.jhin.2020.04.012>