

Assessment of Belqas Central Hospital's Policies Regarding COVID-19 Screening in Labor and Delivery Unit

1Fatma Mohamed Tolba, 2 Yousif A. &3 Hanan El-Sayed Mohamed El-Sayed



1Nursing Specialist at Belqas central Hospital, Dakahlia , Egypt.

2Assistant professor of Woman's Health and Midwifery Nursing, Faculty of Nursing, Mansoura University, Egypt.

3Professor and Head of Woman's Health and Midwifery Nursing Department, Faculty of Nursing, Mansoura University, Egypt.

Corresponding author E-mail: fatmatolba884@gmail.com

1.ABSTRACT

Background: Hospital policies for COVID-19 screening at labor and delivery unit is crucial for preventing spread of infection between parturient women as well as health care providers. **Aim:** This study aims to assess Belqas Central Hospital's policies regarding COVID-19 screening in labor and delivery unit. **Study design:** A descriptive cross sectional study design was used. **Setting:** The study was carried out in labor and delivery unit at Belqas central hospital. **Sample type:** A convenient sample was utilized. **Study sample:** The study sample included all health care providers in the labor and delivery unit. **Tools:** A structured interview questionnaire about health care providers general characteristics and their awareness about hospital policies, checklist about hospital facilities for COVID-19 screening policies, and application of health care providers of COVID-19 screening policies at labor and delivery unit. **Results:** The present study showed that two third of doctors and nurses and one quarter of cleaner workers had adequate awareness about hospital facilities. More than two third of doctors, majority of nurses and two fifth of cleaner workers had adequate awareness about screening policies. Around one third of doctors, half nurses and majority of cleaner workers had inadequate awareness about birthing partner screening policies. Most doctors and nurse screened pregnant women for fever. Only about two fifth of doctors and nurses washed their hands completely before and after screening parturient women. **Conclusion:** More than half of the hospital facilities was available but not enough. More than one third of doctors and nurses and three quarters of cleaner workers had inadequate awareness about hospital policies. Around half of health care providers (doctors, nurses, and cleaner workers) didn't completely apply the hospital policies as wearing gown & eye protection, asking about COVID-19 exposure history, changing gloves, and using 0.1 chlorine solution for disinfection of surfaces and floors. **Recommendation:** Health care providers need educational programs about COVID-19 screening policies to increase their awareness.

Keywords: COVID-19, Delivery, Hospital Policies, Labor, Screening

2.Introduction

Hospitals play a critical role in providing essential health services to people in the healthcare system. Healthcare systems around the world have faced some issues in responding to patients with various disease severity levels. Nowadays, the world as a whole is combating a pandemic called coronavirus disease 2019 (COVID-19). To deal with the challenges of the COVID-19 pandemic, hospitals must have completed their preparations before it causes an increase in the disease spread with fluctuated patient demand that may affect the hospitals' capacity (Gul & Yucesan, 2021).

During the COVID-19 pandemic, different countries are showing strengths and weaknesses of both health care systems and technology access. (Pittaluga & Deana, 2021). Regardless the numbers of COVID-19 patients, many hospitals experienced shortages of personal protective

equipment (PPE) or supplies for ventilators, reflecting both inadequate reserves and interrupted supply chains (Wu et al., 2021). The scientific understanding of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), how it spreads, and the COVID-19 pandemic's effects on public health, the economy, and society haven't stopped developing. Many nations keep proving that SARS-CoV-2 transmission can be stopped. According to several studies, high-risk individuals should undergo routine monitoring of Covid-19 transmission (Hsu et al., 2021).

Given that they may be more susceptible to more serious infections and unfavorable pregnancy outcomes, obstetric patients have drawn attention (Overton et al., 2021). A live systematic review conducted by the World Health Organization in 2020 came to the conclusion that SARS-CoV-2

infection during pregnancy was linked to an increased risk of preterm birth, intensive care unit hospitalization for mothers, and neonatal care admission for infants. (Vousden et al., 2022).

As the pandemic continues, screening for SARS-CoV-2 should be maintained in healthcare settings with appropriate infection prevention and control (IPC) measures (Choo et al., 2021). In order to prevent postponing medical treatments that are not dependent on COVID-19, clinics should avoid becoming transmission hotspots and safeguard vulnerable patient populations in particular. It is crucial to screen for COVID-19 because it helps to stop the spread of the infection within hospitals. (Jabs et al., 2022).

2.1 Significance of the study

Worldwide, according to the WHO records on February 4, 2021, With the second wave, SARS-CoV-2 virus resulted in a total of 103,989,900 confirmed cases and 2,260,259 deaths (Khamees, Taha & Ali, 2021). So, assessment of hospital policies can help in identifying weak and strength points and help to improve these policies which can save the life of millions of pregnant women and their babies.

Worldwide, many of the 145 million annual births including about 400,000 babies born daily are at risk. The case fatality rate is estimated at 2–3%. By 25 May 2020, 5 371 700 cases of COVID-19 had been reported globally, including 344 815 deaths. Egypt is among the five countries reporting the highest number of cases in Africa with a total of 17 265 cases as of 25 May 2020. The first case in Egypt was recorded 15 February (Radwan, 2020).

These facts put health care systems in a great challenge as COVID-19 spreads rapidly with close physical contact (Boelig et al., 2020). It's crucial for hospitals to put screening policies at labor and delivery departments to identify suspected cases early and prevent spread of infection between patients and health care workers and prevent complications for infected women and their babies. So, the researcher decides to conduct this study.

2.2 Aim of the study

This study aimed to assess Belqas Central Hospital's policies regarding COVID-19 screening in labor and delivery unit.

2.3 Research questions

- What are the hospital policies regarding COVID-19 screening in labor and delivery unit?

- Do the health care providers apply the hospital policies regarding COVID-19 screening in labor and delivery unit?

3. Method

3.1 Study design

A descriptive cross sectional study design was used in this study. A descriptive research design can use a wide variety of research methods to investigate one or more variables. The researcher does not control or manipulate any of the variables, but only observes and measures them (Sharma, 2018).

3.2 Study setting

The research was done in the labor and delivery department at Belqas center hospital, Dakahlia Governorate. It located at the first floor and consists of 5 rooms with approximately 2 beds and bathroom for each room for staying patient, sonar room, eclampsia room with bathroom, room for preparing medication, doctors' room with bathroom, natural birth booth and big hall with nursing station.

3.3 Sample type: A convenient sample was used

3.4 Study Sample: The study sample was included all healthcare providers in the labor and delivery unit (35 doctors, 20 nurses, and 15 cleaner workers) with total number 70.

3.5 Tools of data collection:

Data was collected using three tools

Tool I: A structured interview questionnaire:

This tool was designed by the researcher after reviewing the national and international literature (Baig, 2020). It consists of two parts:

Part 1: General characteristics of the health care providers as age, occupation, level of education and years of experience.

Part 2: Health care provider's awareness regarding hospital policies. It was developed by the researcher after reviewing the relevant literature (Boelig et al., 2020) to assess health care provider's awareness regarding hospital policies. It included (13) questions as (awareness about hospital facilities, awareness about screening policy, awareness about site of screening.... etc.

Scoring system:

The scoring system was 1 point for yes, 0 point for No. The total scoring system ranged from 0 - 13. If the total score less than 75% have inadequate awareness regarding hospital policies, if the total score equal and more than 75% have adequate awareness regarding hospital policies

(Africa center for disease control and prevention, 2021).

Tool II: Checklist of hospital facilities for COVID-19 screening policies. It was developed by the researcher after reviewing the relevant literature (Africa center for disease control and prevention, 2021; Ministry of health of Canada, 2020; Boelig et al., 2020; and WHO, 2021) to assess the facilities provided by the hospital to help the health care providers to apply the COVID-19 screening policies at the hospital. It included observation for the training programs for HCPs about screening policies, the site of screening and patient care areas.... etc. The researcher assessed the hospital facilities one time at the beginning of the study as available and enough, available but not enough, not available.

Tool III: Application of health care providers COVID-19 screening policies at labor and delivery unit checklist. It was developed by the researcher. It consisted of two parts:

Part 1: Doctors and nurses application of COVID-19 screening policies in labor and delivery unit. It was developed by the researcher after the researcher reviewed the literature on screening for SARS-COVID-19 (Africa center for disease control and prevention, 2021; Ministry of health of Canada, 2020, Boelig et al., 2020).

This part included six domains.

Domain 1: It included eight items to assess the site of screening. **Domain 2:** It included five items to assess screening of pregnant women when entering to triage area for labor and delivery. **Domain3:** It included four items to assess screening the pregnant women for COVID-19 history. **Domain 4:** It assessed if doctors and nurses assessed the pregnant women for the most common twenty COVID-19 signs and symptoms. **Domain 5:** It included nine items to assess dealing with positive screened pregnant women. **Domain 6:** It consisted of seven items to assessed cleaning and disinfecting of screening site and screening equipment.

Part 2: Cleaner worker application of cleaning and disinfecting policies at COVID-19 screening site in labor and delivery unit checklist. It was developed by the researcher after reviewing the relevant literature (WHO, 2021 and Ying Liu, Zhang, Tu, & Leck, 2020). It was consisted of sixteen items.

Scoring system

The scoring system was 2 points for completely Done, 1 point for Incompletely done, and 0 point for Not done. The total scoring system

ranged from 69% - 138%. If the total score less than 50% the policy is not done, if the total score range from 50% - 75%, the policy incompletely done, if the total score more than 75%, the policy completely done (Africa center for disease control and prevention, 2021). For domain 4 and domain 5 no items were incompletely done during data collecting period so the scoring system was changed to 2 points for completely done and 1 point for not done.

3.6Validity of the tools

Data collection tools was tested and juried for the content validity by five Expertise in woman's health and midwifery nursing field (Assist. Prof/ Eman Fadel, Assist. Prof/ Nadia Yousif, Assist. Prof/ Om Hashem Mahmoud, Dr/ Marwa Ibrahim, and Dr/ Heba Abd Elrehem). Their suggested modifications such as adding some additional questions about HCPs awareness to be more comprehensive and detailed for assessing HCPs awareness about hospital screening policies.

3.7Tools Reliability:

Internal consistency and a reliability coefficient (Cronbach's alpha) of the components of the tool of data collection were tested by SPSS software. Cronbach's alpha showed high reliability values of study tools. The Cronbach's alpha value (internal consistency) of the health care provider's awareness regarding hospital policies was (0.901), and for the health care providers application of COVID-19 screening policies in labor and delivery unit was (0.893) and for the hospital facilities for COVID-19 screening policies in labor and delivery unit was (0.887).

3.8Pilot study

A pilot study was conducted prior to data collection on 10% (7) of the study sample (3 doctors, 2 nurses, and 2 cleaner workers) to evaluate the clarity and applicability of these tools and estimating the time needed for answer. The sample of pilot study was excluded from the total sample.

3.9Ethical considerations

The study received ethical approval from the Mansoura University Faculty of Nursing Research Ethics Committee. Following an explanation of the study's nature and objectives, all participants provided their signed, informed consent. Each participant has the right to withdraw from the study at any time. Participation in the study was voluntary. Throughout the entire study, anonymity, privacy, safety, and secrecy were fully guaranteed. The outcome was used for publication, instruction, and the necessary research for a master's degree.

3.10 Study Procedure:

- The study was conducted for 5 month's period from 20th of March 2022 to 21th of August 2022. It was carried out through two stages; preparatory and operating stages.
- Preparatory stage included: administrative steps, reviewing literature and developing tools and pilot study.
- Operating stage included: data collection and data analysis.

Preparatory stage:

- Administrative steps:** Official permission to carry out the study was obtained from the director of Belqas Central hospital, head of obstetrics and gynecology department after explaining the aim of the study, head of woman's health and midwifery nursing department and from the faculty of nursing ethical committee to conduct the study.
- Reviewing literature and developing tools:** The researcher reviewed the national and international literature on theoretical knowledge regarding hospital policies regarding COVID-19 screening at L&D unit and the review collected was a guide for developing the tools of data collection.

Operating Stage:

1-Data Collection steps

- Data were collected from labor and delivery unit at Belqas central hospital after having the official written approval from faculty of nursing research ethics committee, Mansoura University to the head of Belqas central hospital
- Before collecting the data, the researcher introduced herself to each HCP and obtained their consent to participate in the study after explaining the study nature and aim.
- The researcher attended to labor and delivery unit at Belqas Center Hospitals from 8:30 A.m. to 4 p.m. daily except Friday.
- After that, the pilot study was carried out on 10% of the sample (7); the pilot sample was excluded from the analyzed sample.
- After that, the researcher assessed the facilities provided by the hospital to help the HCPs to apply the policies for one time.
- The researcher informed the HCPs that the study has a voluntary nature after they provided informed consent.
- Each HCP was interviewed individually by the researcher in private setting to assess their

general characteristics and their awareness about hospital policies regarding COVID-19 screening at L&D unit by asking questions and recording the answers each HCP took from (20-25) minute to answer the questions.

- Then, the researcher assessed HCPs implementation of the policies by using an observational checklist, each HCP took from (15-30) minutes.
- The researcher attended the previously mentioned setting and the data were collected from predetermined setting until assessment total number of health care providers.
- At the end of data collection, the total number of HCPs was 70.

2-Data Analysis Phase:

Data were sorted, organized, categorized and then transferred into specially designed formats. SPSS (Statistical package for the social sciences) for Windows version 20.0 (SPSS, Chicago, IL) was used to conduct all statistical analyses. Continuous data were expressed in mean and standard deviation (SD), both of which had a normal distribution. Numbers and percentages were used to express categorical data. Fisher's Exact test was used for comparison of variables with categorical data. The reliability (internal consistency) test for the questionnaires used in the study was calculated. Statistical significance was set at $p \leq 0.05$.

Study limitation:

Because of the novelty of the topic of COVID-19 as the WHO declared the COVID-19 outbreak a global pandemic On 11 March 2020 ([Cucinotta & Vanelli, 2020](#)), and it took a short period of time and started to decline after the presence of the vaccine. it was so hard for the researcher to find other researches with the same directions or used similar assessment tool specially at labor and delivery unit.

4.Results

Table (1) Shows that half of the studied sample aged from 25 < 35 years with mean (27.2 \pm 7.5 years), 50 % were doctors, and 37.1% were postgraduate. 38.6% of the studied sample had experience from 5 < 10 years.

Table (2) Shows that (100%, 80% and 40% respectively) from the studied doctors, nurses and cleaner workers were aware about COVID-19 signs and symptoms. (91.4%, 82.9%, 80% and 80%, respectively) from doctors, (70% and 80%, respectively) from nurses and (73.3%, 40%, 80%

and 20%, respectively) from cleaner workers were aware about positive screened women policies, PPE, screening on admission, and screening for history policies. 77.1% of doctors, (80% and 70% respectively) of nurses and (53.3% and 26.7% respectively) of cleaner workers were aware about usage of PPE and hospital facilities. (71.4%,74.3% and 68.6 respectively) of doctors, (70%, 90%, 80% and 50% respectively) of nurses and (66.7%, 86.7%, 20% and 40% respectively) of cleaner workers were aware about screening site, screening time, disinfection of screening equipment and site, birthing partners screening, and screening policies.

Figure (1): Shows that 70%, 65.7% & 26.7% respectively of nurses, doctors and cleaner workers had adequate awareness about COVID-19 hospital policies.

Figure (2) Shows that 58% of the studied hospital facilities for COVID-19 screening policies were available but not enough. While 26% of it were not available and 16% were available and enough.

Table (3) shows that 49.9% of the studied doctors and 10% of studied nurses weren't completely designated at the front of the unit to verbally screen the woman for upper respiratory tract infection symptoms. No one of them conducted screening on ideally site behind a barrier to protect from contact or droplet spread, or from a plexiglass barrier for screening site. (40%, 28.6%, 77.1%, 20%, and 60% respectively) of doctors and (20%, 30%, 50%, 15%, and 65% respectively) of nurses not maintaining 2 metre distance from patient, not wearing gloves, gown, surgical mask, and eye protection when plexiglass barrier not available.

Table (4) Shows that (40% and 68.6% respectively) and (35% and 65% respectively) of the studied doctors and nurses didn't screen birthing partners for COVID-19 verbally, and

pregnant women for history of travelling outside Egypt or order to quarantine in the last 14 days. (57.1%, 62.9% and 100% respectively) and (45%, 50%, 80% and 100% respectively) of the studied doctors and nurses completely screened the pregnant women for symptoms of COVID-19, even if they have been screened upon entry to the hospital, screened for exposure history for COVID -19 and didn't permit positive screened birthing partners to labor and delivery unit. (60%, 54.3%, 48.6% respectively) and (65% and 60%) of doctors and nurses screened pregnant women for history if; had had tested positive for COVID-19 in the past 10 days, told to be isolating, and exposed to suspected or confirmed COVID19 cases.

Table (5) shows that (100%, 53.3%,33.3% and 46.7%, respectively) of the studied cleaner worker didn't wear PPE before cleaning and disinfecting screening site as eye protection, gown, surgical mask, care specially for exposed to respiratory droplet surfaces, and not use 0.1 chlorine solution for disinfecting surfaces. Also (46.7%, 40%, 33.3%, respectively) of them didn't completely use fresh clothes and solutions for each cleaning shift, wash hand with water and soap before and after cleaning and disinfecting, clean and disinfect screening site after every screened woman, and wash hands before wearing PPE. While (100%, 80%, 73.3%, respectively) of them cleaned exposed to respiratory droplet surfaces before disinfection, disposed gloves and masks in a leak-proof plastic bag, used two water puckets for surface cleaning, used 0.5 chlorine solution for blood and body fluid spills disinfection, and wore disposable impermeable gloves before cleaning and disinfection.

Figure (3) Shows that (45.7%) of doctors, (50%) of nurses, and (46.7%) of cleaner workers incompletely applied hospital policies according to their total score.

Table (1): Distribution of the studied sample according to their general characteristics

Characters	Items	n (70)	%
Age	15 < 25 years	13	18.6
	25 < 35 years	35	50.0
	35 < 45 years	18	25.7
	≥ 45 years	4	5.7
Mean ±SD:27.2 ±7.5			
Occupation	Doctor	35	50.0
	Nurse	20	28.6
	Worker	15	21.4
Level of education	Read and write	6	8.6
	Diploma education	11	15.7
	Institutional education	17	24.3

	Bachelor's	10	14.3
	Postgraduate	26	37.1
Years of experience	< 3	22	31.4
	3 < 5	11	15.7
	5 < 10	27	38.6
	≥10	10	14.3

Table (2): Distribution of the studied healthcare providers according to their awareness regarding COVID-19 hospital policies

Are you aware about	Aware					
	Doctors		Nurses		Cleaner workers	
	n (35)	%	n (20)	%	n (15)	%
Hospital facilities	27	77.1	14	70	4	26.7
Screening policies	24	68.6	16	80	6	40
Site of screening	25	71.4	16	80	8	53.3
Time of screening	26	74.3	14	70	10	66.7
Screening on admission	28	80	16	80	12	80
Birthing partners screening policies	24	68.6	11	55	3	20
Usage of personal protective equipment	27	77.1	16	80	8	53.3
Personal protective equipment	29	82.9	16	80	6	40
Screening for history policies	28	80.	14	70	3	20
COVID-19 signs and symptoms	35	100	16	80	6	40
Positive screened women policies	32	91.4	14	70	11	73.3
Disinfection of screening sites policies	24	68.6	16	80	13	86.7
Disinfection of screening equipment policies	26	74.3	18	90	13	86.7

Figure (1): Distribution of the studied healthcare providers' awareness regarding hospital policies total score

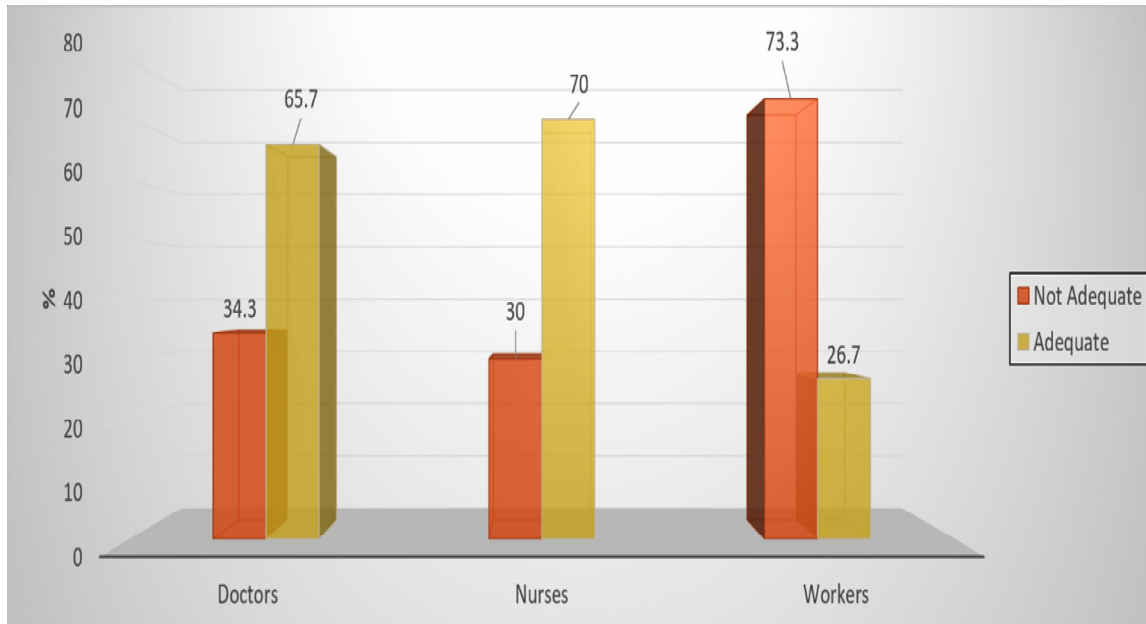


Figure (2): Distribution of the studied hospital according to its facilities for COVID-19 screening policies in labor and delivery unit total score

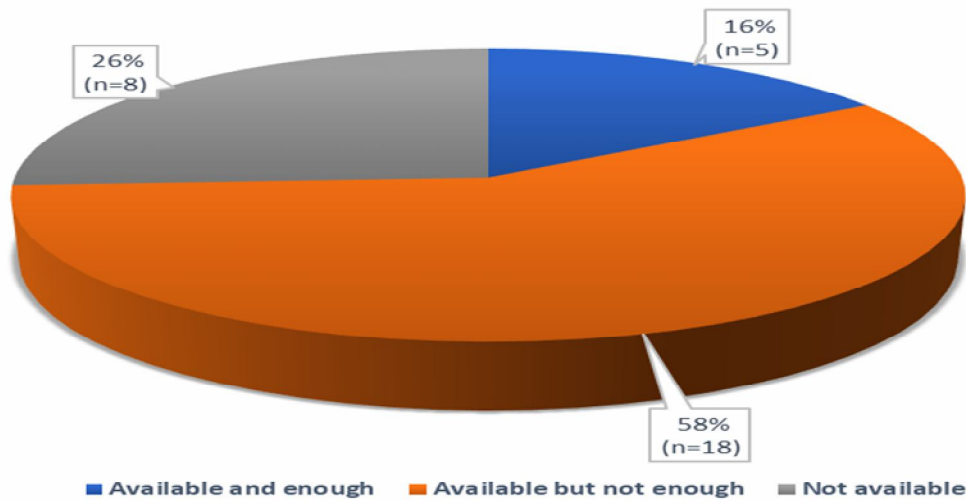


Table (3): Distribution of the studied doctors and nurses according to their application of COVID-19 screening policies at labor and delivery unit regarding site of screening

Site of screening	Not done				Not completely done				Completely done			
	Doctors		Nurses		Doctors		Nurses		Doctors		Nurses	
	n(35)	%	n(20)	%	n(35)	%	n(20)	%	n(35)	%	n(20)	%
A designated staff member at the front of the unit verbally screens the woman for upper respiratory tract infection (URTI) symptoms	6	17.1	5	25	15	42.9	2	10	14	40	13	65
Doctors conducting screening on ideally site behind a barrier to protect from contact/droplet spread	35	100	20	100	0	0.0	0	0.0	0	0.0	0	0.0
Doctors conducting screening from a plexiglass barrier for screening site	35	100	20	100	0	0.0	0	0.0	0	0.0	0	0.0
If a plexiglass barrier is not available, staff member												
Maintains a 2-metre distance from the patient	14	40	4	20	19	54.3	14	70	2	5.7	2	10
Contact/Droplet precautions as gloves	10	28.6	6	30	9	25.7	6	30	16	45.7	8	40
Contact/Droplet precautions as gown	27	77.1	10	50	0	0.0	2	10	8	22.9	8	40
Contact/Droplet precautions as surgical/procedure mask	7	20	3	15	6	17.1	2	10	22	62.9	15	75
Contact/Droplet precautions as eye protection	21	60	13	65	0	0.0	0	0.0	14	40.0	7	35

Table (4): Distribution of the studied nurses and doctors according to their application of COVID-19 screening policies at labor and delivery unit regarding screening on admission

Screening on admission	Not done				Not completely done				Completely done			
	Doctors		Nurses		Doctors		Nurses		Doctors		Nurses	
	n(35)	%	n(20)	%	n(35)	%	n(20)	%	n(35)	%	n(20)	%
Screen the parturient women upon entry and admission to triage area for labor and delivery for symptoms of COVID-19	0	0.0	2	10	15	42.9	9	45	20	57.1	9	45
Screen the pregnant women upon entry and admission to triage area for labor and delivery for exposure history for COVID -19.	8	22.9	3	15	5	14.3	1	5	22	62.9	16	80
Screen the parturient women upon entry and admission to triage area for labor and delivery for covid 19 even if they have been screened upon entry to the hospital	6	17.1	4	20	9	25.7	6	30	20	57.1	10	50
Birthing partners is verbally screened for COVID-19	14	40.0	7	35	10	28.6	5	25	11	31.4	8	40
If birthing partners screen positive, they don't permit to labor and delivery unit (n=2)	0	0.0	0	0.0	0	0.0	0	0.0	2	100	2	100
Doctors screen parturient woman's history for												
Exposure to suspected or confirmed COVID19 cases	18	51.4	8	40	0	0.0	0	0.0	17	48.6	12	60
Travelling outside Egypt and if the woman was told to quarantine in the last 14 days	24	68.6	13	65	0	0.0	0	0.0	11	31.4	7	35
If the woman had tested positive for COVID-19 in the past 10 days	14	40	7	35	0	0.0	0	0.0	21	60.0	13	65
If the woman has been told she should be isolating	16	45.7	7	35	0	0.0	0	0.0	19	54.3	13	65

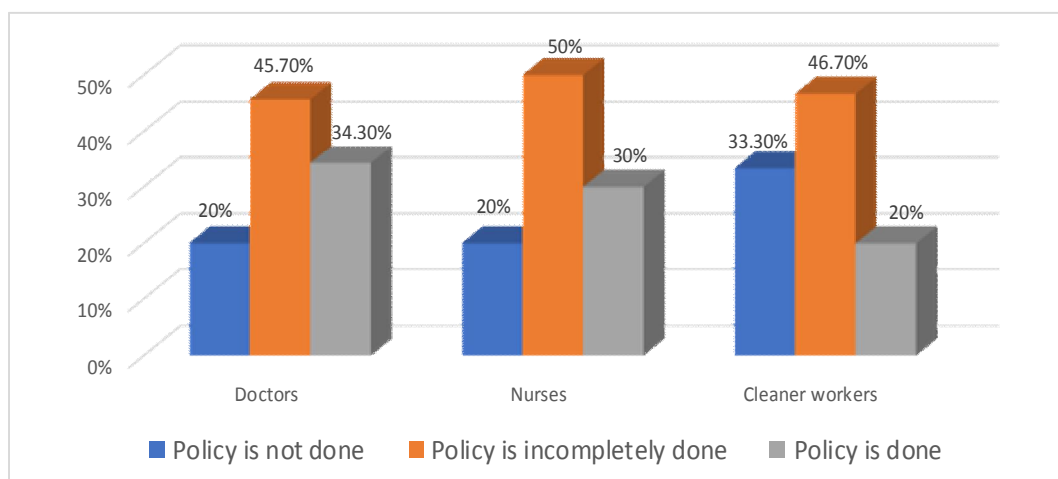
Table (5): Distribution of the studied cleaner workers according to their application of cleaning and disinfecting policies at screening for COVID-19 site at labor and delivery unit (n =15):

Screening for COVID-19 site	Not done		Not completely done		Completely done	
	N	%	n	%	n	%
Clean screening site after every screened woman	3	20.0	6	40.0	6	40.0
Disinfects screening site after every screened woman	2	13.3	6	40.0	7	46.7
Wash hands with water and soap before cleaning and disinfecting screening site	2	13.3	7	46.7	6	40.0
Wash hands with water and soap before wearing personal protective equipment	2	13.3	5	33.3	8	53.3
Wears personal protective equipment before cleaning and disinfecting screening site as disposable impermeable gloves	4	26.7	0	0.0	11	73.3

Assessment of Belqas Central Hospital's . . .

Wears personal protective equipment before cleaning and disinfecting screening site as gown	8	53.3	0	0.0	7	46.7
Wears personal protective equipment before cleaning and disinfecting screening site as surgical/procedure mask	5	33.3	3	20.0	7	46.7
Wears personal protective equipment before cleaning and disinfecting screening site as eye protection	15	100.0	0	0.0	0	0.0
Uses two buckets of water (one for clean water and one for soapy water) for surface cleaning.	0	0.0	3	20.0	12	80.0
Uses 0.5 chlorine solution for disinfection of blood and body fluid spills	3	20.0	0	0.0	12	80.0
Uses 0.1 chlorine solution for disinfection of surfaces and floors	7	46.7	0	0.0	8	53.3
Wash hands with water and soap after cleaning and disinfecting screening site	3	20.0	6	40.0	6	40.0
Takes special care for surfaces that patient has touched directly or that have been exposed to respiratory droplet	5	33.3	0	0.0	10	66.7
Clean surfaces that have been exposed to respiratory droplet before disinfecting it	0	0.0	0	0.0	15	100.0
Disposes of gloves and masks in a leak-proof plastic bag	0	0.0	0	0.0	15	100.0
Uses fresh clothes and fresh solutions of detergent and disinfectant for each cleaning shift	0	0.0	7	46.7	8	53.3

Figure (3): Distribution of the studied doctors and nurses according to their application of hospital policies total score.



5. Discussion

The study aimed to assess Belqas central hospital's policies regarding COVID-19 screening in labor and delivery unit. The study aim was supported by the study finding. The present study answered the research question such findings evidenced that about two third of doctors and majority of nurses had adequate awareness about hospital policies, while near three quarters of cleaner workers didn't have adequate awareness about it.

Nearly three quarters of doctors and more than two third of nurses were aware about hospital facilities for COVID-19 screening policies in labor

and delivery unit. Conversely, only about one quarter of cleaner workers were aware about it. While, about half of doctors, nurses, and cleaner workers incompletely applied the hospital policies according to their total score. Also, more than half of the hospital facilities for COVID-19 screening policies in labor and delivery unit were available but not enough.

Regarding health care providers awareness about hospital policies

The present study results shows that more than two third of doctors and nurses had adequate awareness about hospital policies, while near three quarters of cleaner workers didn't have adequate

awareness. The difference in the result for cleaner workers may be due to absence of training programs for them. The studied hospital had training program for nurses and doctors but not adequate which cause inadequate awareness for one third of them. nearly three quarters of doctors and more than two third of nurses were aware about hospital facilities, **Conversely**, only one quarter of cleaner workers were aware about it.

The present study findings revealed that about one quarter of nurses and doctors and near two third of cleaner workers had inadequate awareness about screening policies. Conversely, **Aleanizy & Alqahtani (2021)** who assessed awareness and knowledge of COVID-19 infection control precautions and waste management among healthcare workers in all Saudi healthcare facilities. They reported that very few percentages of HCPs didn't know if their health facilities have infection control policies and guidelines in their unit. The difference between results may be as the studied hospital didn't has adequate training programs for HCPs.

The present study results showed that, about three quarters of nurses and doctors and only about one quarter of cleaner workers had adequate awareness about hospital facilities. the present findings were not in the same direction with the study by **Aleanizy & Alqahtani (2021)**. They reported that most HCPs were aware of the availability of all infection control supplies at their health facilities. The difference of the results may be as the mentioned studied hospitals has availability of all infection control supplies and help workers to know about it.

The present study results showed that more than four fifth of doctors were aware about types of needed personal protective equipment, and more than three quarters of them were aware about usage of personal protective equipment. The study results were agreement with the study conducted in Janakpur by **Jha, Jha, & Jha (2021)** they assessed knowledge, attitude, and practice regarding COVID-19 among doctors. They reported that four fifth of doctors know the requirement of PPE and most of them know the correct use of PPE.

Also, the present study results showed majority of nurses had adequate awareness about PPEs and its usage. Conversely, the study conducted by **Elhadi et al. (2020)** they assessed healthcare workers' levels of preparedness and awareness regarding COVID-19 infection in low-resource setting in Libya. they reported that half of doctors and nurses knew about PPE. The difference in the results may be due to low-resource setting.

While, the present study results showed that all the studied doctors had adequate awareness about COVID-19 signs and symptoms. Also, most nurses had adequate awareness too. The results were in agreement with **Ahmed et al. (2020)** they assessed knowledge, awareness and practice of health care professionals amid corona virus disease outbreak in various hospitals and clinics. They reported that most of health care providers had awareness about COVID-19 signs and symptoms.

The present study results were disagreement with **Jha, Jha, & Jha (2021)**. They reported that only three quarters of doctors had knowledge about COVID-19 signs and symptoms. Moreover, the study results were disagreement with the study conducted by **Elhadi et al. (2020)**. They reported that less than half of doctors and nurses know COVID-19 signs and symptoms.

The current study results showed that most of doctors and less than three quarters of nurses and cleaner workers had adequate awareness about positive screened women policies. The present findings were not in the same direction with the study by **Elhadi et al. (2020)**. They reported that only about one quarter of HCP know the protocol for triage and isolation of suspected cases.

The current study results showed that most nurses and cleaner workers and about three quarters of doctors had adequate awareness about disinfection of screening equipment policies. Inversely, the present study findings were dissimilarity with that of **Aleanizy & Alqahtani (2021)**. They reported that about half of HCPs know the procedure and protocol for processing of equipment's for reuse.

Regarding site of screening

The present study finding revealed that two fifth of doctors were designated at the front of the unit to verbally screen the pregnant women for upper respiratory tract infection symptoms, while near two third of nurses did. In contrast a study conducted by **Boelig et al. (2020)** they addressed the current coronavirus disease 2019 (COVID-19) pandemic for providers and patients in labor and delivery to provide guidance regarding methods to appropriately screen and test pregnant patients for COVID-19 prior to, and at admission to labor and delivery . They reported that when women arrive at Labor & Delivery unit, a designated staff member at the front of the unit should verbally screen each individual for upper respiratory tract infection symptoms. The present study results were in disagreement with **WHO (2021)** who continues to recommend to screen all persons for COVID-19

at the first point of contact with the health facility to allow for early recognition. The difference between the results may be due to inadequate designated staff member for COVID-19 screening and inadequate training programs for screening and triage at the studied hospital.

The present study finding revealed that, the studied hospital didn't has enough training for health care providers about screening and not designating enough staff members for screening. The results were with the same line with **Iheanacho et al. (2021)**. They assessed knowledge, attitude, practice and training related to COVID-19 of healthcare workers in Nigeria. They reported that all groups of HCPs surveyed wanted additional trainings on COVID-19 screening.

Conversely, the study results were in disagreement with **WHO (2021)** who mentioned that health facilities should train staff on the signs and symptoms of COVID-19 and the most recent case definitions. Also, **government of the district of Colombia (2021)** ensured that trained personnel must be available for follow-up questions as needed during the screening process to further evaluate risk.

The present study finding revealed that, the studied hospital didn't had ideally site with a barrier to protect from contact/droplet spread as a plexiglass barrier, which lead to no one from the studied nurses and doctors screened pregnant women at ideally site for COVID-19 screening. **Conversely**, the study conducted in Canada by **Ministry of health (2020)** to provide COVID-19 guidance for labor, delivery and newborn care. This study found that, health care provider conducting screening on site should ideally be behind a barrier to protect from contact/droplet spread. Also, **WHO (2020)** ensured that screening personnel should maintain a distance of at least 1 metre from patients, ideally with a separation created by a glass/plastic screen. If that is not possible, mask and eye protection should be worn.

The present study results showed that most doctors and nurses didn't maintain 2 metre distance from pregnant women during screening. The results were in agreement with **Afeng-Nkansah et al. (2021)**. They assessed the response of healthcare workers to COVID-19 protocols after the index case at 37 military hospitals, Ghana. They reported that majority of healthcare providers did not enforce physical distancing and enforcing physical distancing among the client and their care providers was poor.

The study results were in disagreement with the study in **Colombia** by **Government of the District of Colombia (2022)** who provide guidelines on the screening needs for anyone entering medical facilities to lower the risk of spreading the SARS-CoV-2 infection to others. This study reported that, staff members who performing in-person screenings should maintain 2 metre distance from patient. The difference in results may be as the dedicated screening and triage areas at the studied hospital didn't have adequate spacing between patients and the staff didn't have adequate training.

Regarding use of PPE in case of absence of barriers, the study finding revealed that near one third of doctors and nurses didn't use gloves, about three quarters of doctors and half nurses didn't use gown, about two third of them didn't use eye protection, and about three quarters of them used mask.

The current study results were in contrast with the study conducted in Tigray, North Ethiopia by **Gebremeskel, Kiros, Gesesew & Ward (2021)**. They assessed knowledge and practices toward COVID-19 prevention among healthcare workers. They reported that more than half of health care providers did not use the necessary PPE at all times. Moreover, similar with a study conducted by **Afeng-Nkansah et al. (2021)** they indicated that the use of appropriate PPE was generally not adhered to and about half of healthcare workers did not use the prescribed PPEs at screening area.

Also, the study results were in agreement with **silva et al. (2022)** they assessed personal protective equipment use and hand hygiene among physical therapists during the COVID-19 pandemic in Brazil. They reported that, near two third of them didn't use eye goggles, more than four fifth of them didn't use gown and near one third of them didn't use gloves. While about four fifth of them used masks.

The study results were in disagreement with the study by **Ministry of health (2020)** who reported that, health care providers who do not have a barrier and cannot maintain a 2-metre distance should use contact and droplet precautions as gloves, gown, a surgical mask, and eye protection (goggles or face shield). The difference between results may be as shortage in PPE at the studied hospital.

Regarding screening on admission

According to the study results about half of the studied nurses and doctors screened pregnant women upon entry to triage area for labor and delivery for COVID-19 symptoms and even if they have been screened upon entry to the hospital. Inversely, the present study findings were in dissimilarity with study conducted by **ministry of health (2020)**. Who found that, every woman should be screened upon entry and admission to triage area for labor and delivery even if she has been screened upon entry to the hospital. The difference between results may be as inadequate training for the staff about the importance of women screening and low follow up from prevention and control team at the studied hospital for screening process.

The present study results showed that, more than one third of studied doctors and nurses didn't screen birthing partners for COVID-19. These results were disagreeing with **Boelig et al. (2020)**. They reported that, all birthing partners should be verbally screened for COVID-19. About the two nurses and two doctors who screened a positive COVID-19 birthing partners didn't permit them to labor and delivery unit. The study findings were agree with the study conducted by **Boelig et al. (2020)**. They found that, birthing partners screen positive should not be permitted to labor and delivery and should be directed to appropriate testing or medical care as indicated.

About screening for history, the current study findings revealed that half of studied doctors and more than one third of nurses didn't screen pregnant women history for exposure to suspected or confirmed COVID-19 cases and if woman has been told to isolate. While the present study results were disagreement with **Government of Canada (2022)** who aimed to guide workers as well as employers on the importance of screening in preventing the spread of COVID-19 in Canadian workplaces. referred to the following screening question "Have you recently been exposed to anyone who has been confirmed to be COVID-19 positive?, Have you recently received instructions to quarantine or isolate? The difference between result may be due to inadequate training for HCPs.

Regarding screening for COVID-19 signs and symptoms

Regarding screening for COVID-19 signs and symptoms, the current study findings showed that most doctors and all nurses screened pregnant women for fever. The study results agree with **Afeng-Nkansah et al. (2021)**. They revealed that

HCPs generally adhered to the use of temperature for screening for COVID-19 at the units.

The current study findings revealed that most of the studied doctors and nurses screened pregnant women for fever, cough, and loss of smell or taste. These findings were in the same directions with the study conducted in India by **Sharma et al. (2020)** who aimed to highlight the main recommendations applied in Indian maternities for better management of pregnancy during the COVID-19 pandemic. They reported that, most common symptoms of COVID-19 in pregnant women are cough, fever, sore throat, dyspnea, myalgia and loss of sense of taste.

Moreover, the current study results showed that near three quarters of doctors screened pregnant women for headache, fatigue, and diarrhea, while more than half of them didn't screen pregnant women for conjunctivities. **Conversely**, near half of studied nurses didn't screen pregnant women for headaches and conjunctivities. While three quarters of them didn't screen pregnant women for fatigue and near two third of them screened pregnant women for diarrhea.

The present study findings were in the same direction with the study by **Palmore & Smith (2022)** who reviewed the general infection prevention principles when caring for patients in areas with community transmission of SARS-CoV-2. They reported that patients should be screened for clinical manifestations consistent with COVID-19 (eg, fever or chills, shortness of breath or difficulty breathing, cough, fatigue, vomiting, myalgias, headache, anosmia/hyposmia, sore throat, dyspnea, congestion or rhinorrhea, nausea, or diarrhea).

Regarding cleaner worker application of cleaning and disinfecting policies

The current study results showed that only two fifth of the studied cleaner workers wash hands with water and soap before and after cleaning and disinfecting screening site while, half of them wash hands with water and soap before wearing personal protective equipment. The study results were in disagreement with **Youssef, Abass, and Hassan (2021)**. They assessed knowledge, attitudes and practices of hospital cleaning services staff towards Coronavirus Disease-2019 (COVID-19). They found that the majority of cleaners stated that they always followed the infection prevention and control (IPC) standard precautions such as hand hygiene practices and always follow recommended hand hygiene practices before and after putting

PPEs or cleaning. The difference in the results may be because of the difference in the data collection methods as they used online survey while the researcher assessed the actual practices and the lack of training programs at the studied hospital for cleaner workers.

The current study results showed that near three quarters of cleaner workers wore disposable impermeable gloves, more than half didn't wore gown, less than half wore surgical mask, and nobody wore eye protection before cleaning and disinfecting screening site. **Inversely**, the present study findings were in dissimilarity with the survey in **university of washington (2023)** to provide COVID-19 cleaning and disinfecting protocol which reflects requirements and guidelines set forth by the Washington State Department of Labor and Industries, the Centers for Disease Control and Prevention (CDC), and the Washington State Department of Health. This protocol mentioned that safety guidelines during cleaning and disinfection were wearing gloves, eye protection when there is a potential for splash or splatter to the face, wear a surgical mask and wear gowns or aprons for larger scale or frequent cleaning. The difference between results may be due to lack of PPEs at the studied hospital.

The current study results showed that three quarters of cleaner workers take special care for surfaces that patient has touched directly or that have been exposed to respiratory droplet. **Inversely**, the present study findings were in dissimilarity with the study in Middle Eastern country by **Youssef et al. (2021)** to assess knowledge, attitudes and practices of hospital cleaning services staff towards Coronavirus Disease-2019 (COVID-19), they reported that most of cleaning staff stated that they cleaned and disinfected common areas at hospitals in addition to the frequently touched objects (handles, elevator buttons, handrails, doorknobs . . .) all the time.

The present study results showed that all cleaner workers cleaned surfaces that have been exposed to respiratory droplet before disinfecting it. These findings were supported by the study conducted by **Georgia Southern University (2020)** who provided COVID-19 online training module for Cleaning and Disinfecting, they reported that detergent or soap and water must be used prior to disinfection. Then, use a household disinfectant.

The present study results showed that about half of cleaner workers used 0.1% chlorine solution for disinfection of surfaces and floor. This result disagrees with **WHO, (2020)** who mentioned that

In the context of COVID-19, the suggested 0.1% chlorine solution is a conservative concentration that will inactivate the great majority of additional microorganisms that might be present in the healthcare environment during the COVID-19 pandemic.

Also, the present study results revealed that majority of cleaner workers used 0.5% chlorine solution for disinfection blood and body fluids. This result agrees with **WHO, (2020)** cleared that a concentration of 0.5% of chlorine solution must be used for large bloody and body fluid spills.

The present study results revealed that all cleaner workers dispose of gloves and masks in a leak-proof plastic bag. These findings were agree with **Youssef et al. (2021)**, They claimed that most of cleaner workers consistently handled waste in an effective manner by putting items that are disposable (such as gloves, hand towels, tissues, and surgical masks) in a container with a lid and adhering to the hospital's action plan and national waste management rules. So it is important to increase awareness about hospital policies between health care providers.

6. Conclusion

Based on the present study finding, the study questions were answered where: two third of doctors and majority of nurses had adequate awareness about hospital policies, while near three quarters of cleaner workers didn't have adequate awareness about it. Nearly three quarters of doctors and more than two third of nurses were aware about hospital facilities for COVID-19 screening policies in labor and delivery unit. Conversely, only about one quarter of cleaner workers were aware about it. While, about half of doctors, nurses, and cleaner workers incompletely applied the hospital policies according to their total score. Also, more than half of the hospital facilities for COVID-19 screening policies in labor and delivery unit were available but not enough.

7. Recommendations

Based on the results of the present study, we recommend that:

- Implementing training programs for all HCPs about screening and triage and continuous follow up and evaluation of their actual performance.
- Providing a screening protocol for HCPs to follow at screening area with enough PPEs and hand hygiene stations.

- Providing checklist and posters at screening area for HCPs with the most common COVID-19 signs and symptoms and screening process.
- Using posters and videos to increase cleaner workers awareness about hospital policies especially types & uses of PPEs, hand washing, COVID-19 signs and symptoms, positive screening women policies and cleaning and disinfecting policies
- Continuous follow up and supervision from infection prevention and control team at hospital for HCPs.
- Perform screening for visitors and birthing partner before entering labor and delivery unit.

Further researches

- Effect of training programs on healthcare provider's adherence to hospital screening policies.

8. References

- Afeng-Nkansah, D., Asumanu, E., Nyinaku, P., Acheampong, F., & Lamptey, R. (2021).** Response of Healthcare Workers to COVID-19 Protocols after the Index Case at 37 Military Hospital, Ghana. *BioMed research international*, 2021, 2873859, 1-6 <https://doi.org/10.1155/2021/2873859>
- Africa center for disease control and prevention, (2021).** covid-19-checklist-for-primary-care-facilities [https://africacdc.org/download/covid-19-checklist-for-primary-care-facilities/+&cd=1&hl=ar&ct=clnk&gl=eg.\(27 May 2021\)](https://africacdc.org/download/covid-19-checklist-for-primary-care-facilities/+&cd=1&hl=ar&ct=clnk&gl=eg.(27 May 2021))
- Ahmed, N., Shakoor, M., Vohra, F., Abduljabbar, T., Mariam, Q., & Rehman, M. A. (2020).** Knowledge, Awareness and Practice of Health care Professionals amid SARS-CoV-2, Corona Virus Disease Outbreak. *Pakistan Journal of Medical Sciences*, 36(COVID19-S4). <https://doi.org/10.12669/pjms.36.COVID19-S4.2704>
- Aleanizy, F. S., & Alqahtani, F. Y. (2021).** Awareness and knowledge of COVID-19 infection control precautions and waste management among healthcare workers. *Medicine*, 100(21), e26102. <https://doi.org/10.1097/md.00000000000026102> Downloaded from <http://journals.lww.com/md-journal>
- Baig, M. A. (2020).** The Rapid COVID Screening (RCS) Tool. *Journal of the College of Physicians and Surgeons Pakistan*, 30(1), 56–58. <https://doi.org/10.29271/jcpsp.2020.supp1.s56>
- Boelig, R. C., Manuck, T., Oliver, E. A., Di Mascio, D., Saccone, G., Bellussi, F., & Berghella, V. (2020).** Labor and Delivery Guidance for COVID-19. *American Journal of Obstetrics & Gynecology MFM*, 2(2), 100110. <https://doi.org/10.1016/j.ajogmf.2020.100110>
- Choo, S. Z. L., Shafri, H., Johan, F. A.-Z., Basir, N., Chong, P. L., Abdullah, M. S., ... Chong, V. H. (2021).** Screening of hospital admissions for COVID-19 in Brunei Darussalam. *Western Pacific Surveillance and Response Journal*, 12(2), 89–91. <https://doi.org/10.5365/wpsar.2020.11.2.009>
- Cucinotta, D., & Vanelli, M. (2020).** WHO declares COVID-19 a pandemic. *Acta bio medica: Atenei parmensis*, 91(1), 157.
- Elhadi, M., Msherghi, A., Alkeelani, M., Zorgani, A., Zaid, A., Alsuyihili, A., Buzreg, A., Ahmed, H., Elhadi, A., Khaled, A., Boughdidah, T., Khel, S., Abdelkadir, M., Gaffaz, R., Bahroun, S., Alhashimi, A., Biala, M., Abulmida, S., Elharb, A., & Abukhashem, M. (2020).** Assessment of Healthcare Workers' Levels of Preparedness and Awareness Regarding COVID-19 Infection in Low-Resource Settings. *The American Journal of Tropical Medicine and Hygiene*, 103(2), 828–833. <https://doi.org/10.4269/ajtmh.20-0330>
- Gebremeskel TG, Kiros K, Gesesew HA and Ward PR (2021)** Assessment of Knowledge and Practices Toward COVID-19 Prevention Among Healthcare Workers in Tigray, North Ethiopia. *Front. Public Health* 9:614321. doi: 10.3389/fpubh.2021.614321
- Georgia Southern University (2020).** Chapter 4: Cleaning and Disinfecting. Covid-19 Training, [online] 6. Available at: https://digitalcommons.georgiasouthern.edu/covid19-training/6/?utm_source=digitalcommons.georgiasouthern.edu%2F6&utm_medium=PDF&utm_campaign=PDFCoverPages [Accessed 28 Feb. 2023].

- Government of Canada, C. C. for O. H. and S. (2022, March 23). CCOHS: Coronavirus (COVID-19) - Tips: Screening for COVID-19. Retrieved from www.ccohs.ca website: <https://www.ccohs.ca/covid19/screening/>
- Government of The Distrect of Colombia. (2022, March 4).** Coronavirus 2019 (COVID-19): Guidance for Screening in the Healthcare Setting. Retrieved September 3, 2022, from https://coronavirus.dc.gov/sites/default/files/dc/sites/coronavirus/page_content/attachments/Screening_in_Healthcare_Settings_COVID-19_DC_Health_%20Guidance_3-4-2022.pdf
- Gul, M., & Yucesan, M. (2021).** Hospital Preparedness Assessment against COVID-19 Pandemic: A Case Study in Turkish Tertiary Healthcare Services. *Mathematical Problems in Engineering*, 2021, 1–18. <https://doi.org/10.1155/2021/2931219>
- Hsu, J.-Y., Liu, P.-Y., Tseng, C.-H., Liu, C.-W., Yang, W.-T., Huang, W.-H., ... Wu, M.-J. (2021).** COVID-19 Screening for Hospitalized Patients: The Role of Expanded Hospital Surveillance in a Low Prevalence Setting. *Journal of Multidisciplinary Healthcare*, Volume 14, 3027–3034. <https://doi.org/10.2147/jmdh.s337258>
- Iheanacho, T., Stefanovics, E., Okoro, U. G., Anyaehie, U. E., Njoku, P. O., Adimekwe, A. I., Ibediro, K., Stefanovics, G. A., Haeny, A., Jackson, A., Unamba, N. N., Isiguzo, G., Chukwu, C. C., Anyaehie, U. B., Mbam, T. T., Osy-Eneze, C., & Ibezim, E. O. (2021).** Assessing knowledge, attitude, practice and training related to COVID-19: A cross-sectional survey of frontline healthcare workers in Nigeria. *BMJ Open*, 11(9), e050138. <https://doi.org/10.1136/bmjopen-2021-050138>
- Jabs, J. M., Schwabe, A., Wollkopf, A. D., Gebel, B., Stadelmaier, J., Erdmann, S., ... Mutters, N. T. (2022).** The role of routine SARS-CoV-2 screening of healthcare-workers in acute care hospitals in 2020: A systematic review and meta-analysis. *BMC Infectious Diseases*, 22(1). <https://doi.org/10.1186/s12879-022-07554-5>
- Jha, S. K., Jha, R., & Jha, N. (2021).** Knowledge, attitude, and practice regarding COVID-19 among doctors of Janakpur, Nepal. *Janaki Medical College Journal of Medical Science*, 9(1), 47. Retrieved from https://www.academia.edu/69905476/Knowledge_attitude_and_practice_regarding_COVID_19_among_doctors_of_Janakpur_Nepal?from_sitemaps=true&version=2
- Khamees, R. E., Taha, O. T., & Ali, T. Y. M (2021).** Anxiety and depression during pregnancy in the era of COVID-19. <https://doi.org/10.1515/Jpm-2021-0181>; *Journal of Perinatal Medicine*.
- Ministry of health, (2020).** COVID-19 Guidance: Labour, Delivery and Newborn Care. (Version 1 – April 30, 2020)
- Ministry of Health of Canada (2020).** COVID-19 Guidance: Labour, Delivery and Newborn Care. [online] Available at: https://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/2019_labour_delivery_%20newborn_guidance.pdf.
- Overton, E. E., Goffman, D., & Friedman, A. M. (2021).** The Epidemiology of COVID-19 in Pregnancy. *Clinical Obstetrics & Gynecology*, 65(1), 110–122. <https://doi.org/10.1097/grf.0000000000000674>
- Palmore, T. N., & Smith, B. A. (2022, February 28).** UpToDate. Retrieved from www.uptodate.com accessed at: <https://www.uptodate.com/contents/covid-19-general-approach-to-infection-prevention-in-the-health-care-setting>
- Pittaluga, L., & Deana, A. (2021).** Evidence-Based Policies in Uruguay Are Successful for Tackling COVID-19. *Open Journal of Political Science*, 11(01), 21–33. <https://doi.org/10.4236/ojps.2021.111003>
- Radwan, G. N., (2020).** Epidemiology of SARS-CoV-2 in Egypt. *Eastern Mediterranean Health Journal*, 26(7), 768-773.
- Sharma, J.B., Sharma, E., Sharma, S. and Singh, J. (2020).** Recommendations for prenatal, intrapartum and postpartum care during COVID - 19 pandemic in India. *American Journal of Reproductive Immunology*, 84(5), e13336. doi:<https://doi.org/10.1111/aji.13336>.
- Silva, C. F., Santos, L. S., Neves, V. A., Ribeiro, E. S., Silva, M. H. M. de L., Nery, J. C., & Gama, G. L. (2022).** Personal protective equipment use and hand hygiene among physical therapists during the COVID-19 pandemic: An observational study. *Research, Society and Development*,

- 11(7), e2211729591.
<https://doi.org/10.33448/rsd-v11i7.29591>
- University of Washington (2023).** COVID-19 PREVENTION: ENHANCED CLEANING AND DISINFECTION PROTOCOLS. [online] p.4. Available at: <https://www.ehs.washington.edu/system/files/resources/cleaning-disinfection-protocols-covid-19.pdf>.
- Vousden, N., Ramakrishnan, R., Bunch, K., Morris, E., Simpson, N. A. B., Gale, C., ... Knight, M. (2022).** Severity of maternal infection and perinatal outcomes during periods of SARS-CoV-2 wildtype, alpha, and delta variant dominance in the UK: prospective cohort study. *BMJ Medicine*, 1(1), e000053. <https://doi.org/10.1136/bmjmed-2021-000053>
- WHO. (2021).** Critical preparedness, readiness and response actions for COVID-19. Retrieved from <https://www.mybib.com/#/projects/D1PRaD/citations/new/report>
- Wu, H., Soe, M. M., Konnor, R., Dantes, R., Haass, K., Dudeck, M. A., ... Benin, A. L. (2021).** Hospital capacities and shortages of healthcare resources among US hospitals during the coronavirus disease 2019 (COVID-19) pandemic, National Healthcare Safety Network (NHSN), March 27–July 14, 2020. *Infection Control & Hospital Epidemiology*, 1–4. <https://doi.org/10.1017/ice.2021.280>
- World Health Organization. (2020).** Cleaning and disinfection of environmental surfaces in the context of COVID-19. Retrieved from <https://apps.who.int/iris/bitstream/handle/10665/332096/WHO-2019-nCoV-Disinfection-2020.1-eng.pdf?sequence=1&isAllowed=y>
- Ying Liu, X., Zhang, Y., Tu, H. X., & Leck, A. (2020).** Cleaning and disinfection in health care settings during the COVID-19 outbreak. *Community Eye Health*, 33(109), 36–37. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7677809/>
- Youssef, D., Abass, L. A., & Hassan, H. (2021).** Knowledge, attitudes and practices of hospital cleaning services staff towards Coronavirus Disease-2019 (COVID-19) in a Middle Eastern country: A web-based cross-sectional study. Accessed at: <https://doi.org/10.21203/rs.3.rs-576799/v1>