Check for updates

RESEARCH ARTICLE

REVISED Personal protective equipment used by obstetricians and obstetric nurses during the COVID-19 pandemic in Mansoura, Egypt [version 2; peer review: 2 approved]

Eman Khashaba [iD]1, Abdel-Hady El-Gilany2, Hend Shalaby3, Rania El-Kurdy [iD]4

[1]Assistant professor of Occupational Health and Industrial Medicine,Public health & Community medicine, Faculty of Medicine,Mansoura University, Mansoura, 35516, Egypt
[2]Professor of Public Health & Preventive Medicine,, Faculty of Medicine, Mansoura University, Mansoura, 35516, Egypt
[3]Professor of Obstetrics & Gynecology, Faculty of Medicine, Mansoura University, Mansoura, 35516, Egypt
[4]Lecturer of Woman's Health & Midwifery Nursing, Faculty of Nursing,Mansoura University, Mansoura, 35516, Egypt

Abstract
Background: This study was done to describe the pattern of personal protective equipment (PPE) use, associated factors, and adverse events among obstetricians and obstetric nurses in obstetrics & gynecology departments.
Methods: A cross sectional study was conducted in Obstetrics & Gynecology departments in three hospitals (physician & nurses n=252) using an online Google form including demographic and occupational health data, type of available personal protective equipment during usual care, CS and emergency labor, infection control measures and hazards of full PPE use.
Results Full PPE use was 37.7% during CS and 34.9% during emergency labor. The significant predictors of wearing full PPE during CS were daily work hours > 8 hours and receiving formal training about PPE use. During CS & emergency labor most of HCws used sterile gloves and sterile fluid resistant gowns and surgical mask.to less extent used face shields or tight fitting googles and one tenth (11.8%) only used N95. The most common health effects of full PPE use was sense of heat (79.5%).
Conclusion: During the COVID-19 pandemic more vigorous respiratory (N95 mask) and eye protection is required during aerosol-generating procedures. Formal training is an evident predictor for full PPE use.

Keywords
PPE use- Obstetricians , Covid 19, Emergency labor, Intrapartum practice, occupational safety

Open Peer Review

Approval Status ✓✓

	1	2
version 2 (revision) 04 Jul 2022	✓ view	
version 1 12 Apr 2022	? view	✓ view

1. **Indranil Saha** [iD], Indian Council of Medical Research, Kolkata, India

2. **Ibrahim Kabbash** [iD], University of Tanta, Tanta, Egypt

Any reports and responses or comments on the article can be found at the end of the article.

This article is included in the Emerging Diseases

and Outbreaks gateway.

Corresponding author: Eman Khashaba (emankhashaba@mans.edu.eg)

Author roles: Khashaba E: Writing – Original Draft Preparation, Writing – Review & Editing; **El-Gilany AH**: Conceptualization, Methodology, Writing – Review & Editing; **Shalaby H**: Data Curation, Methodology, Supervision, Writing – Review & Editing; **El-Kurdy R**: Data Curation, Methodology, Writing – Original Draft Preparation, Writing – Review & Editing

How to cite this article: Khashaba E, El-Gilany AH, Shalaby H and El-Kurdy R. **Personal protective equipment used by obstetricians and obstetric nurses during the COVID-19 pandemic in Mansoura, Egypt [version 2; peer review: 2 approved]** F1000Research 2022, **11**:413 https://doi.org/10.12688/f1000research.110835.2

First published: 12 Apr 2022, **11**:413 https://doi.org/10.12688/f1000research.110835.1

> **REVISED** **Amendments from Version 1**
>
> There is no major differences in the submitted manuscript and new version; only few clarifications in logistic regression results text of and statistical analysis paragraph and type of snowball sampling technique.
>
> **Any further responses from the reviewers can be found at the end of the article**

Introduction

COVID-19 is a global pandemic affecting all populations, and subsequent worldwide aggressive measures have been taken to mitigate the spread of the infection (World Health Organization (WHO), 2020). According to a study on COVID-19 characteristics and predicting factors among healthcare providers in a developing country, approximately two-thirds of exposure occurred primarily during healthcare provision. Furthermore, one-fifth of the cases were confirmed COVID-19 cases; the majority of them had mild to moderate symptoms, with only 9.1 percent asymptomatic. Almost all became infected while on duty (97.4 percent). Infected patients (39%) were the most common source of infection, followed by colleagues (22.1%), household contacts (5.2%), and unknown sources (33.8 percent) (El-Sokkary *et al.*, 2021).

Obstetricians have worked tirelessly for the past three decades to enhance women's outcomes through the use of evidence-based medicine. The present COVID-19 epidemic has flooded this standardized method with a deluge of contradicting material, causing uncertainty in the birthing ward about recommended practices. As the infection spreads throughout the population, obstetricians are becoming more concerned (Sichitiu & Desseauve, 2020).

Asymptomatic patients are contagious and thus are at a high risk of nosocomial infection (Rothe *et al.,* 2020). Therefore, strict PPE usage for doctors and midwives is necessary at labor if universal screening is not performed (Umazume *et al.*, 2020).

Regulating and adapting all aspects of infection prevention can be difficult in the unfortunate event of a maternal collapse. The delivery room is overloaded when many personnel simultaneously attempt to resuscitate the collapsed patient, perform a perimortem cesarean delivery, and resuscitate the newborn. The resuscitation team should don full PPE. The most common frequent & serious cross-infection to healthcare workers during outbreaks happened when first responders were not wearing the recommended PPE (Schwartz and Graham, 2020).

Wearing N95 respirators can reduce clinical respiratory infections by 73 per 1,000 healthcare workers (HCWs). In laboratory-confirmed bacterial colonization, N95 respirators had a protective effect. N95 respirators were found to be more effective in preventing laboratory-confirmed respiratory viral infections and influenza-like illnesses. As regards protection of HCWs, no direct high-quality evidence was found on whether N95 respirators are better than surgical masks for from SARS-CoV-2 (Iannone *et al.*, 2020).

Despite the protective PPE value, one study reported that physicians who work in the intensive care unit (ICU) and deal with such patients are naturally anxious. They would be unable to drink, eat, or go to the toilet for approximately 6 hours after wearing full PPE as required in the ICU. Taking off PPE after duty hours necessitates training and extreme caution to avoid self-infection (Alsubaie *et al.*, 2019).

Worldwide, reports of PPE scarcity and unavailability are emerging. HCWs and the general press use social media to report on the reusing of PPE or the use of household and self-made items in place of PPE. There is limited evidence on the effectiveness of these practices, but they have occasionally been implemented on the advice of their employers or health organizations (England, 2020; CDC, 2020). It is believed that no previous studies discuss the pattern of PPE utilization among obstetricians and obstetric nurses during the COVID-19 pandemic in our country.

Study objectives

This study aims to describe the pattern of PPE use, associated factors, and adverse events among healthcare workers in obstetrics and gynecology departments.

Methods
Study design

Observational cross-sectional study with an analytic component.

Study place and time

The study was conducted in Obstetrics & Gynecology Departments in three hospitals (one is affiliated to Mansoura University and two affiliated to the Ministry of Health & Population) from August 2020 to June 2021.

Study participants

The study included on-duty obstetric physicians and nurses during the COVID-19 pandemic. Participation was voluntary and anonymous.

The sample size was calculated by openepi.com, an online sample size calculator. It was calculated according to the primary outcome of interest which is the anticipated frequency of full PPE use (30%) based on a pilot study of 100 subjects. The current study has a target population (~954 workers), power of the study (80%), and precision degree (5%). The sample size is 242, and 10% was added to cover nonresponse from online surveys. Thus, the final sample was 266 subjects.

Data collection approach

The current study collected, first, personal communication between one of the authors and study subjects in selected hospitals to encourage participation and explain study objectives. Second, an online questionnaire was distributed ($n = 266$) through posting Google links to WhatsApp personal accounts or WhatsApp groups of their departments. Snowball sampling technique (exponential non discriminative) was used by asking participants to share the link with other healthcare workers in the obstetrics and gynecology departments in their hospitals. Finally, the response rate was 252 (79.2%).

Study tool

The questionnaire included demographic data; occupational history; type of available personal protective equipment during usual care, Cesarean section (CS), and emergency labor; infection control measures related to the use and discard of equipment; and hazards of full PPE during COVID-19 pandemic.

Operational case definition of full PPE use was adapted from the national baseline resources and recommendations of the International Society of Ultrasound in Obstetrics and Gynecology, Royal College of Obstetricians and Gynaecologists, Collège National des Gynécologues et Obstétriciens Français (Poon *et al.,* 2020; Royal College of Obstetricians and Gynaecologists, 2021; Peyronnet *et al.,* 2020). The definition of PPE use in the current study included using gown with long sleeves, gloves (sterile gloves for CS and latex gloves for usual care), respiratory protection (N95 mask or FFP or surgical mask), eye protection (face shield or goggle), and foot protection (overshoes or safety boots).

Ethical considerations

The study was approved by the Research Ethics Committee of the Faculty of Medicine of Mansoura University (code number: R/20.7.925). Informed verbal consent was obtained from the administration of hospitals affiliated with the Ministry of Health and Population. All study participants were assured of the confidentiality and anonymity of the data at the start of Google form, and participation was voluntary.

Statistical analysis

Data were analyzed using SPSS, version 23. Categorical variables are presented as numbers and percentages, and the chi-squared test was used for comparison between groups. Crude odds ratios and their 95% confidence intervals (CIs) were calculated. Moreover, quantitative variables are presented as means and standard deviations. Binary stepwise logistic regression analysis was used to determine the independent predictors of full PPE use as the dichotomous outcome variable. Variable found to have statistical significance in bivariate analysis were entered into the logistic regression analysis using a Forward-Wald model. Model fitness by Hosmer and Lemeshow test was non-significant (p value > 0.05) which indicates Good fit for model. Adjusted odds ratios and their 95% CIs were calculated. A p value ≤ 0.05 was statistically significant.

Results

Demographic characteristics

The study included 252 healthcare workers in the obstetrics and gynecology departments. Most of the studied participants were females (76.2%), has a mean age of 32.2 (9.9), and nearly half of them are from urban areas (47.2%). About two-thirds (57%) of the studied HCWs were from Mansoura University Hospitals. More than half were nurses (56.7%) and 37.7% were physicians. The median work duration in years and median daily work hours were 7 years and 8 h, respectively. One-fifth of them (20.2%) reported work in hospital isolations. Most of them reported exposure to COVID-19 patients (75.5%). However, the polymerase chain reaction-confirmed COVID-19 infection was about one-third (27.3%) of the studied HCWs. This percentage is exactly half of those were symptomatic workers (50.9%; data are not tabulated).

Factors associated with full PPE use

Full PPE use was 37.7% and 34.9% during CS and emergency labor, respectively. Full PPE use during CS was significantly associated with longer work hours ($\geq$8 h), working in hospital isolation, and receiving formal training about PPE use ($p < 0.05$). Moreover, it was associated with working in hospital isolations and receiving formal training during emergency labor ($p < 0.05$; Table 1) (Khashaba, 2022).

Table 1. **Factors associated with full PPE use among study participants during CS & emergency labor.**

Associated factors	Total	Full PPE during CS		Full PPE during emergency labor	
		n (%)	COR (95%CI)	n (%)	COR (95%CI)
Overall	**252**	95 (37.7%)	----	88 (34.9%)	---
Age					
≤30 (r)	117	48 (41.)	0.7 (0.4-1.2)	43 (36.8)	0.8 (0.5-1.4)
>30	135	47 (34.8)		45 (33.3)	
Sex			0.8 (0.4-1.4)		
Male (r)	60	25 (41.7)		25 (41.7)	0.6 (0.3-1.2)
female	192	70 (36.5)		63 (32.8)	
Educational level					
Technical institute (r)	135	47 (34.8)		43 (31.9)	
Bachelor	47	17 (36.2)	1.06 (0.5-2.1)	19 (40.4)	1.4 (0.7-2.8)
Post graduate studies	70	31 (44.3)	1.4 (0.8-2.6)	26 (37.1)	1.2 (0.6-2.3)
Type of hospital[#]					
University (r)	139	58 (41.7)		48 (34.5)	
MOH	105	36 (34.3)	0.7 (0.4-1.2)	36 (34.3)	0.9 (0.6-1.7)
Job description					
Physician (r)	95	41 (43.2)		36 (37.9)	
Nurse	157	54 (34.4)	0.6 (0.4-1.16)	52 (33.1)	0.8 (0.4-1.4)
Duration of work					
≤7 years (r)	146	54 (37)		55 (37.7)	
>7 years	106	41 (38.7)	1.07 (0.6-1.8)	33 (31.1)	0.7 (0.4-1.2)
Daily work hours					
< 8 hours (r)	114	31 (27.2)		36 (31.6)	
≥ 8 hours	138	64 (46.4)	2.3 (1.3-3.9) *	52 (37.7)	1.3 (0.7-2.2)
Work in isolation hospital					
No (r)	201	68 (33.8) *		64 (31.8)	
Yes	51	27 (52.9)	2.2 (1.2-4.1) *	24 (47.1)	1.9 (1.0-3.5) *
Exposed to covid 19 infection					
No (r)	64	24 (37.5)		22 (34.4)	
Yes	188	71 (37.8)	1.01 (0.5-1.8)	66 (35.1)	1.0 (0.5-1.8)
Confirmed covid 19 infection					
No (r)	194	70 (36.1)		64 (31.8)	
Yes	58	25 (43.1)	1.3 (0.7-2.4)	24 (47.1)	1.4 (0.7-2.6)
Received formal training					
No (r)	92	25 (27.2)	2.08 (1.2-3.6)	22 (23.9)	2.2 (1.2-3.9)
Yes	160	70 (43.8)		66 (41.3)	

[#]Missing data from type of hospital 11 subjects, row percent is considered, COR: crude odds ratio.

Table 2. Logistic regression analysis for predictors of full PPE use during CS.

Predictors	Full PPE during CS			Full PPE during emergency labor		
	β	p value	Adjusted OR (95%CI)	β	p value	Adjusted OR (95%CI)
Daily work hours						
< 8 hours (r)			1	-	-	-
≥ 8 hours	0.81	0.003	2.3 (1.3-3.8)			
Received Formal training						
No (r)			1			1
Yes	0.71	0.01	2.03 (1.16-3.5)	0.8	0.006	2.2 (1.2-3.9)
Constant	-1.45			-1.15		
Percent correctly predicted	64.3			65.1		
Model χ^2	16.1; 0.001			7.9; 0.005		

Multivariable logistic regression model for predictors of wearing full PPE during CS revealed that >8 h daily work hours (odds ratio [OR], 2.3; 95% CI, 1.3–3.8) and receiving formal training about PPE use (OR, 2.03; 95% CI, 1.16–3.5) were statistically significant among obstetricians during the COVID-19 pandemic. A significant predictor of full PPE use during emergency labor was receiving formal training only ($p < 0.05$; OR, 2.2; 95% CI, 1.2–3.9. The regression model predicted 64.3% & 65.1% of variation in full PPE use during CS and emergency labor (dependent variable); Table 2).

Pattern of PPE use & infection control measures among study participants
During CS, most healthcare workers used sterile gloves (88%), sterile fluid-resistant gowns (75.6%), and surgical masks (79.2%). About half (52.6%) used face shields. About one-third of them used tight-fitting goggles (34.3), and one-tenth (11.8%) only used N95. Moreover, during emergency labor, most healthcare workers used sterile gloves (81.1), sterile fluid-resistant gowns (70.7), and surgical masks (83.7%). Washing gloves and reusing gowns were reported in 26.8% and 14.8% of HCWs, respectively. Most of the study subjects reported changing gloves between patients (87.7%). More than two-thirds of the subjects followed the correct sequence of donning, removing PPE, and receiving formal training on the use of PPE (67.1%, 66.4%, and 63.5%, respectively; Table 3).

Adverse health effects of full PPE use
The most common health effect of full PPE use is a sense of health (79.5%) followed by a sense of thirst and pressure areas (64.7% and 64.3%, respectively; Figure 1). More than two-thirds of affected HCWs (68.3%) had more than two symptoms. Adverse events were not associated with age, gender, job description, duration of work in years, work hours, or work in hospital isolations ($p > 0.05$; data are not tabulated).

Table 3. Pattern of PPE use & infection control measures among study participants.

Variable (valid responses)	Study subjects n (%)
PPE during CS	
Wear sterile fluid resistant gown (n = 248)	189 (75.6)
Wear surgical mask (n = 241)	198 (79.2)
Wear N95 (n = 241)	29 (11.8)
Wear FFP3 (n = 240)	8 (3.3)
Wear face shield (n = 245)	132 (52.6)
Wear tight fitting goggles (n = 247)	86 (34.3)
Wear foot protective equipment (n = 248)	162 (64.8)
Wear sterile gloves (n = 248)	220 (88)

Table 3. *Continued*

Variable (valid responses)	Study subjects n (%)
PPE during emergency labor	
Wear sterile fluid resistant gown (n = 248)	176 (70.7)
Wear surgical mask (n = 246)	206 (83.7)
Wear N95 (n = 246)	21 (8.5)
Wear FFP3 (n = 246)	10 (4.1)
Wear mask before entering room (n = 234)	210 (89.4)
Wear tight fitting goggles or face shield (n = 248)	79 (31.7)
Wear foot protective equipment (n = 242)	212 (87.6)
Wear sterile gloves (n = 248)	202 (81.1)
Remove mask before leaving (n = 248)	170 (68.0)
Limited number of staff per case (n = 247)	205 (83.0)
General infection control measures	
Changed gloves after use in between patient (n = 251)	221 (87.7)
Wash gloves when visibly contaminated (n = 251)	67 (26.8)
Reused gowns (n = 183)	27 (14.8)
Avoid touching your face with contaminated gloves (n = 248)	226 (91.1)
Avoid touching environmental surfaces with contaminated gloves (n = 251)	222 (88.4)
Hand hygiene immediately after patient touching or leaving examination room (n = 248)	218 (87.9)
Discard gloves in the nearest appropriate receptacle "red bags" (n = 249)	220 (88.4)
Follow correct sequence of donning PPE (n = 246)	165 (67.1)
Follow correct sequence of removing PPE (n = 250)	166 (66.4)
Received formal training on use of PPE (n = 252)	160 (63.5)

Percent is calculated according to total valid responses (between parenthesis).
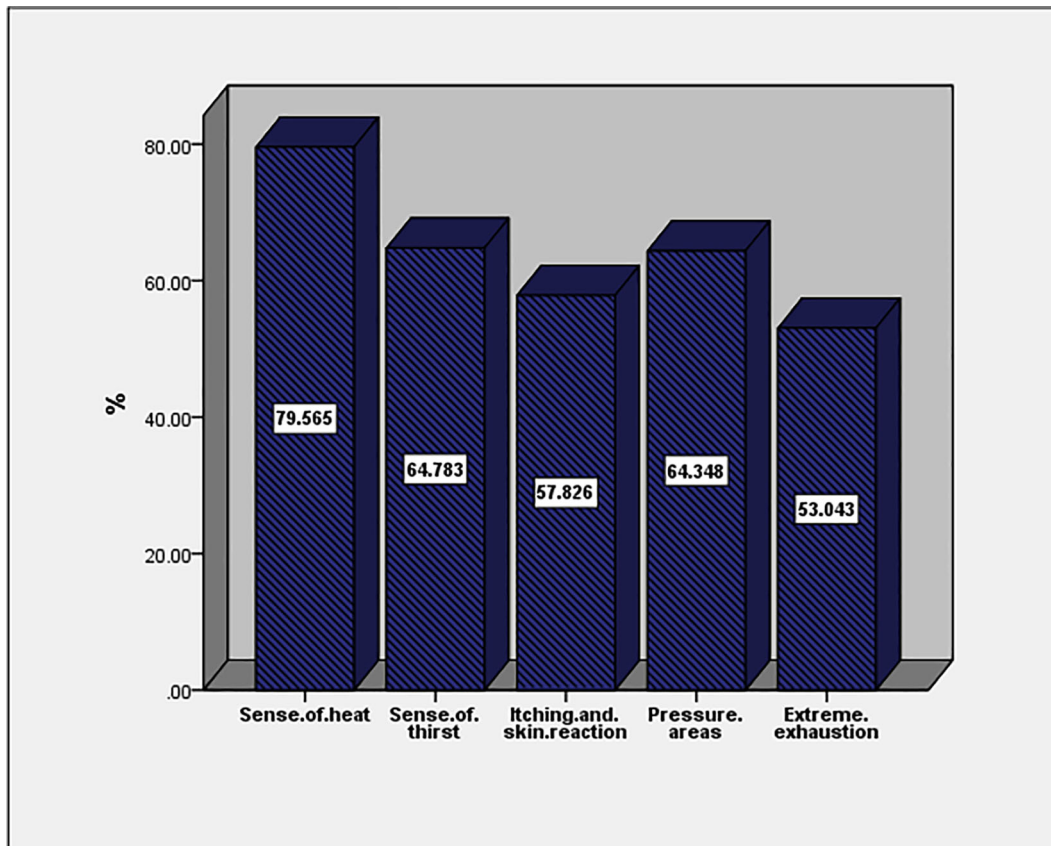

Figure 1. Adverse effects of full PPE use among study participants.

Discussion

This is the first study on PPE use among healthcare workers in the obstetrics and gynecology departments during the COVID-19 pandemic in Egypt. PPE use is influenced by the workload of HCWs as a matter of hours and patients, baseline resources in these hospitals, and stockpiling of personal equipment and safety training for those HCWs (Tabah *et al.*, 2020).

The present study showed that full PPE use was 37.7% and 34.9% during CS and emergency deliveries, respectively. Full PPE use during CS was significantly associated with longer work hours (≥8 h) and formal training on PPE use. A different description for the pattern of full PPE per facility was noticed by a nationwide survey in Japan including core facilities and affiliated hospitals of obstetrics and gynecology training programs. Authors reported that full PPE was used by doctors and midwives in 7.1% and 6.8% of facilities, respectively, taking into consideration the different definitions of full PPE use in both studies.

The present study showed that most healthcare workers used sterile gloves, sterile fluid-resistant gowns, and surgical masks during CS and emergency labor. Fewer HCWs used face shields and goggles. Only one-tenth used N95 due to the absence of baseline resources of these hospitals. Of the HCWs, less than one-third reported washing gloves (26.8%) and reusing gowns (14.8%). Surgical masks and N95 respirators are the most consistent and complete support measures used by healthcare personnel, according to a Cochrane-approved systematic review on physical interventions to reduce respiratory virus transmission undertaken in 2011. N95 respirators are non-inferior, according to the highest quality cluster-randomized controlled studies included in this systematic review (Jefferson *et al.*, 2011).

Another web-based survey conducted by Tabah *et al.* (2020) and distributed worldwide in April 2020 among ICU HCWs found that more than half of the respondents (52%) reported that at least one piece of the standard PPE is not available, and 30% reported that at least a piece of single-use PPE was being reused or washed as a result of shortages. Most of the available PPEs were designed for single-use and brief duration. Hence, the authors reported that urgent design and manufacture of PPE that can be safely worn and remains effective for extended durations are needed.

Similarly, the first nationwide Japanese survey reported that N95 masks and goggles or face shields were out of stock in 6.5% and 2.7% of facilities, respectively. In addition, disposable N95 masks and goggles or face shields were reused after resterilization in 12% and 14% of facilities, respectively (Umazume *et al.*, 2020).

Masks and respirators play a role in the protection of health workers according to high level of agreement among key agencies. However, there are current differences between these agencies in terms how and when the different products are used. Different recommendations have been made by the World Health Organization (WHO), the US Centers for Disease Control and Prevention (CDC), and other leading health organizations. For example, the WHO recommends using N95, FFP2, FFP3 standards or equivalent in care settings for COVID-19 patients where aerosol-generating procedures are used and medical masks are used in the absence of aerosol-generating procedures (WHO, 2020). In contrast, the US Centers for Disease Control and Prevention (Center for Disease Control and Prevention, 2020) recommend using respirators during both routine care of COVID-19 patients and high-risk situations.

In this study, more than two-thirds of the subjects followed the correct sequence of donning and removing PPE and receiving formal training on PPE use (67.1%, 66.4%, and 63.5%, respectively). These results came lower than those observed among ICU workers in a worldwide web-based survey who found that most of the respondents (83%) had formal training in PPE use. This included training at the start of the institution (13%) and within the last two months (60%) due to the COVID-19 pandemic (Tabah *et al.*, 2020).

In addition, current study results revealed that receiving formal training on PPE use among obstetric physicians and nurses was a significant predictor of full PPE use together during CS and emergency labor. These results are in agreement with an Italian study on a cross-section of physicians which reported that access to adequate information on the use of PPE was associated with a better ability to perform donning and doffing procedures as an example for proper PPE use (Savoia *et al.*, 2020).

The most common health effects of full PPE use in the current study is a sense of heat (79.5%) followed by a sense of thirst and pressure areas (64.7 and 64.3%, respectively). More than two-thirds of affected HCWs (68.3%) had more than two symptoms. These results were different from the results found in ICU workers during the pandemic where 80% had adverse events including heat (51%), thirst (47%), pressure areas (44%), headaches (28%), inability to use the bathroom (27%), and extreme exhaustion (,20%). They were all associated with longer duration of shifts wearing PPE. However, in the current study, adverse events were not associated with age, gender, job description, duration of work in years, work hours, or work in hospital isolation (Tabah *et al.*, 2020).

Conclusions

Most obstetricians and obstetric nurses used surgical masks, gloves, gowns, foot protection, and, to a lesser extent, N95, goggles, and face shields. Work hours (>8 h) and formal training were significant predictors for full PPE use.

Based on the findings of the current study, adding N95 or FFP mask and eye protection for safety programs in obstetrics and gynecology departments during aerosol-generating procedures is recommended. Also, reducing long shift work hours that may lead to adverse events due to full PPE use is recommended. Providing simple training videos about different types, proper PPE donning and removal, disinfection of reused equipment, and hand hygiene frequently as part of CME hours of physicians and nurses are required to cope with this emerging threat.

Limitations of the study

The evaluation of PPE sufficiency during the COVID-19 pandemic was not assessed in this study. Further research is required to address PPE protective value in infected HCWs compared to non-infected controls.

Data availability

Underlying data

Harvard Dataverse: Personal protective equipment use by obstetricians and obstetric nurses during the COVID-19 pandemic in Mansoura, Egypt, https://doi.org/10.7910/DVN/XQRZB4 (Khashaba, 2022).

This project contains the following underlying data:

- D.Eman ppe_obestritians.tab

Extended data

Harvard Dataverse: Personal protective equipment use by obstetricians and obstetric nurses during the COVID-19 pandemic in Mansoura, Egypt, https://doi.org/10.7910/DVN/XQRZB4 (Khashaba, 2022).

This project contains the following extended data:

- English Questionnaire PPE.pdf

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

References

Alsubaie S, Hani Temsah M, Al-Eyadhy AA, *et al.*: **Middle East Respiratory Syndrome Coronavirus epidemic impact on healthcare workers' risk perceptions, work and personal lives.** *J. Infect. Dev. Ctries.* 2019; **13**(10): 920–926.
Publisher Full Text

Center for Disease Control and Prevention: **Recommended guidance for extended use and limited reuse of N95 filtering facepiece respirators in healthcare settings.** 2020. [Last accessed 31 August 2021].
Reference Source

El-Sokkary RH, El-Kholy A, Mohy Eldin S, *et al.*: **Characteristics and predicting factors of corona virus disease-2019 (COVID-19) among healthcare providers in a developing country.** *PLoS One.* 2021; **16**(1): e0245672.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

England PH: **Considerations for acute personal protective equipment (PPE) shortages 2020.** 2020. [Last accessed 31 August 2021].
Reference Source

Iannone P, Castellini G, Coclite D, *et al.*: **The need of health policy perspective to protect healthcare workers during COVID-19 pandemic. A GRADE rapid review on the N95 respirators effectiveness.** *PloS One.* 2020; **15**(6): e0234025.
PubMed Abstract | **Publisher Full Text**

Jefferson T, Del Mar CB, Dooley L, *et al.*: **Physical interventions to interrupt or reduce the spread of respiratory viruses.** *Cochrane Database Syst. Rev.* 2011; **6**(7): CD006207.
Publisher Full Text

Khashaba E: **Personal protective equipment use by obstetricians and obstetric nurses during the COVID-19 pandemic in Mansoura, Egypt.** 2022. Harvard Dataverse, V1 [Dataset].
Publisher Full Text

Khashaba E: **Personal protective equipment use by obstetricians and obstetric nurses during the COVID-19 pandemic in Mansoura, Egypt.** 2022. Harvard Dataverse, V1 [Extended data].
Publisher Full Text

Peyronnet V, Sibiude J, Deruelle P, *et al.*: **Infection with SARS-CoV-2 in pregnancy. Information and proposed care.** *CNGOF. Gynecol. Obstet. Fertil. Senol.* 2020. published online March 18, 2020.
PubMed Abstract | **Free Full Text** | **Reference Source**

Poon LC, Yang H, Lee JC, *et al.*: **ISUOG Interim Guidance on 2019 novel coronavirus infection during pregnancy and puerperium: information for healthcare professionals.** *Ultrasound Obstet. Gynecol.* 2020. published online March 11, 2020.
PubMed Abstract | **Free Full Text** | **Reference Source**

Rothe C, Schunk M, Sothmann P, *et al.*: **Transmission of 2019-nCoV infection from an asymptomatic contact in Germany.** *N. Engl. J. Med.* 2020; **382**(10): 970–971.
PubMed Abstract | **Publisher Full Text**

Royal College of Obstetricians and Gynaecologists: **Coronavirus (COVID-19) infection and pregnancy.** 2021. [last accessed 25th September 2021].
Reference Source

Savoia E, Argentini G, Gori D, *et al*.: **Factors associated with access and use of PPE during COVID-19: A cross-sectional study of Italian physicians.** *PloS One.* 2020; **15**(10): e0239024.
PubMed Abstract | **Publisher Full Text**

Schwartz DA, Graham AL: **Potential maternal and infant outcomes from (Wuhan) coronavirus 2019-nCoV infecting pregnant women: lessons from SARS, MERS, and other human coronavirus infections.** *Viruses.* 2020; **12**(2): 194.
PubMed Abstract | **Publisher Full Text**

Sichitiu J, Desseauve D: **Intrapartum care of women with COVID-19: A practical approach.** *Eur. J. Obstet. Gynecol. Reprod. Biol.* 2020; **249**: 94–95.
PubMed Abstract | **Publisher Full Text**

Tabah A, Ramanan M, Laupland KB, *et al*.: **Personal protective equipment and intensive care unit healthcare worker safety in the COVID-19 era (PPE-SAFE): an international survey.** *J. Crit. Care.* 2020; **59**: 70–75.
PubMed Abstract | **Publisher Full Text**

Umazume T, Miyagi E, Haruyama Y, *et al*.: **Survey on the use of personal protective equipment and COVID-19 testing of pregnant women in Japan.** *J. Obstet. Gynaecol. Res.* 2020; **46**(10): 1933–1939.
PubMed Abstract | **Publisher Full Text**

Open Peer Review

Current Peer Review Status: ✅ ✅

Version 2

Reviewer Report 11 July 2022

https://doi.org/10.5256/f1000research.135686.r143061

✅ **Indranil Saha** (iD)

ICMR-Centre for Ageing and Mental Health (I-CAM), Indian Council of Medical Research, Kolkata, West Bengal, India

The authors have satisfactorily answered and responded to all my previous queries. Now the revised manuscript can be indexed.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Non-communicable diseases, Mental Health, ageing, communicable diseases

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 28 June 2022

https://doi.org/10.5256/f1000research.122487.r136541

✅ **Ibrahim Kabbash** (iD)

Department of Public Health and Community Medicine, Faculty of Medicine, University of Tanta, Tanta, Egypt

The articles discusses the issue of protective equipment use among health care workers. The

lessons learnt from the field can be implemented to control the infection. Here I would like to raise some queries, which need to be clarified from the authors:

1. The sampling method technique was referred to as snowballing by the authors; however, it is actually a convenient sample as it does not meet the criteria for snowballing.

2. How did the authors identify the links of social media they used for recruiting participants to ensure representativeness of their sample to the target population?

3. How did the authors motivate the participants to share the data collection, and what was the duration to reach the desired sample size?

Overall the manuscript is well written. The authors have responded satisfactorily to the comments provided the other reviewer.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: epidemiology of infectious diseases, HIV/AIDS, reproductive health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 29 Jun 2022
Eman Khashaba, Faculty of Medicine,Mansoura University, Mansoura, Egypt

Response to reviewer's comments
Thanks a lot for your valuable and accurate comments
1. The sampling method technique was referred to as snowballing by the authors; however, it is actually a convenient sample as it does not meet the criteria for snowballing.

> **Reply: Thanks for your comment. Actually, snowball sampling technique was used in this study. The questionnaire was distributed as on line Google form through what app groups of target population. Direct interview or self-reported questionnaires were not feasible due to lockdown of COVID-19 and strict hospitals policies of minimizing personal contacts with health care workers. The first subject was recruited to the sample then he provides multiple referrals for research.**
> **Further clarification of sampling methods was added based on the comments of the first reviewer.**

2. How did the authors identify the links of social media they used for recruiting participants to ensure representativeness of their sample to the target population?

> **Reply: Through WhatsApp groups of related departments whenever available or from one to his colleagues in the same department.**

3. How did the authors motivate the participants to share the data collection, and what was the duration to reach the desired sample size?

> **Reply: In general, participation was voluntary and the response rate was 252 (79.2%). The personal protection is crucial part in occupational health & safety of HCws during such pandemic. This research stressed on the value of personal protection among obstetricians & nurses.**
> **Duration already present in the manuscript from August 2020 to June 2021 About 1 year.**

Competing Interests: No competing interests were disclosed.

Reviewer Report 28 April 2022

https://doi.org/10.5256/f1000research.122487.r134790

? Indranil Saha (iD)

ICMR-Centre for Ageing and Mental Health (I-CAM), Indian Council of Medical Research, Kolkata, West Bengal, India

The article is pertinent in the level of policy implications. The lessons learnt from the field can be implemented to control the infection. Here I have raised some queries, which need to be clarified from the authors.

The methodology section needs to be elaborated further. Since three hospitals were studied, what was the representation of the study population in the final sample itself? Moreover, were the original proportion of doctors and nurses in these 3 hospitals maintained in the final sample?

Ideally, two sampling frames are ideal, or one sampling frame containing both doctors/nurses.

Table 1: Subheading is absent. Please insert.

Why was the snowball sampling technique used in this study? It is generally used to reach hard to reach study subjects. That is not the case in this study.

Moreover, which type of snowball sampling technique was used - Linear/Exponential, Non-discriminative/Exponential discriminative?

The output of the logistic regression was also incomplete. What about the model fitness? The variation of dependent variables explained from independent variables? What proportion can be explained from the model? Please mention as running text in the results section.

The final model was a multivariable logistic binary regression model. Please mention this.

I would recommend replacing the term 'study subjects' with 'study participants'.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Non-communicable diseases, Mental Health, ageing, communicable diseases

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have

significant reservations, as outlined above.

Author Response 30 Apr 2022

Eman Khashaba, Faculty of Medicine,Mansoura University, Mansoura, Egypt

Response to reviewer's comments

Thanks a lot for the valuable and informative comments.

The methodology section needs to be elaborated further. Since three hospitals were studied, what was the representation of the study population in the final sample itself? Moreover, were the original proportion of doctors and nurses in these 3 hospitals maintained in the final sample?

Reply: The actual number of doctors and nurses in each hospital is not of concern as we aimed to complete the sample size calculated. Also the number on duty is not fixed due to frequent sick leaves, and many of them are not regular users of mass media to complete questionnaire in due time. In general, the number of the nurses is more than the doctors in original sample.

The proportion of each hospital was not kept in the final sample.
This can be added TO STUDY LIMITATIONS.
Ideally, two sampling frames are ideal, or one sampling frame containing both doctors/nurses.

Reply: For our study, it is one sampling frame containing both doctors/nurses

Table 1: Subheading is absent. Please insert.

Reply: Yes I agree we can add "associated factors".

Why was the snowball sampling technique used in this study? It is generally used to reach hard to reach study subjects. That is not the case in this study.

Reply: **The questionnaire was distributed on line with a Google form through WhatsApp groups of the target population. Direct interview or self-reported questionnaires were not feasible due to being in a lockdown as a result of the COVID-19 pandemic, and strict hospitals policies of minimizing personal contacts with health care workers.**

Moreover, which type of snowball sampling technique was used - Linear/Exponential, Non-discriminative/Exponential discriminative?

Reply: The type of snowball sampling technique is Exponential non discriminative (I agree to add this type in the published manuscript).The first subject recruited to the sample provides multiple referrals for participation in research.

The output of the logistic regression was also incomplete. What about the model fitness? The variation of dependent variables explained from independent variables? What proportion can be explained from the model? Please mention as running text in the results section. The final model was a multivariable logistic binary regression model. Please mention this.

Reply:
1. **Model fitness by Hosmer and Lemeshow test was non-significant (p value>0.05) which indicates Good fit for model. Nagelkerke R^2 was less than 1 for both models.**

2. **For the comment on multivariable logistic regression, I agree to modify this comment in results section.**

<u>The necessary changes will be as follows:</u>

Multivariable logistic regression model for predictors of wearing full PPE during CS revealed that >8 h daily work hours (odds ratio [OR], 2.3; 95% CI, 1.3–3.8) and receiving formal training about PPE use (OR, 2.03; 95% CI, 1.16–3.5) were statistically significant among obstetricians during the COVID-19 pandemic. A significant predictor of full PPE use during emergency labor was receiving formal training only ($p < 0.05$; OR, 2.2; 95% CI, 1.2–3.9;). The regression model predicted 64.3% & 65.1% of variation in full PPE use during CS and emergency labor (dependent variable).

I would recommend replacing the term 'study subjects' with 'study participants'.

Reply: I agree with you it can be replaced in the published manuscript &table headings).

Competing Interests: None

The benefits of publishing with F1000Research:

- Your article is published within days, with no editorial bias

- You can publish traditional articles, null/negative results, case reports, data notes and more

- The peer review process is transparent and collaborative

- Your article is indexed in PubMed after passing peer review

- Dedicated customer support at every stage

For pre-submission enquiries, contact research@f1000.com

F1000Research