

Health Care Workers Compliance with Preventive Measures for Covid-19 in Intensive Care Units

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Abstract

Background: Healthcare workers are at the forefront of COVID-19 intervention. Unfortunately, due to highly infected patients with novelty of the virus and the unequipped of hospital to deal with the sudden influx of situations. **Aim:** to describes the health care workers compliance with preventive measures for covid-19 in ICUs. **Setting:** The study was carried out on intensive care units (trauma=19, chest=15, general =12, post-operative=12 obstetric=22 ICUs). All health care workers received a cumulative training of standard and additional precautions at health care facility. **Method:** A prospective cross-sectional study design was conducted among 80 HCWs with COVID-19 infection at Assiut University Hospitals within one year. Two tools were utilized to collect data; Each participant was contacted individually by the researchers; the questionnaire was distributed to the participants. Data were collected using a self-administered, valid, structured questionnaire. **Results:** The high percent of healthcare workers (82.5%) always use alcohol-based hand rub or soap and water after touching a patient, (70%) follow recommended hand hygiene practices, (91.3%) had cough and 68 (85 %) had sore throat. **Conclusion and Recommendations:** The incidence of infection increase, while HCWs followed infection prevention and control measures. Thus vaccinate all health care workers are recommended. In addition, high-risk HCWs could be assigned duties away.

Keywords: Health care workers, prevention measures & COVID 19

Introduction

Adherence of infection control measures is essential aspect in minimizing the threat of coronavirus disease COVID 19 infection among healthcare workers (HCWs) in intensive care units (ICUs) (Ashinyo, et al., 2021). HCWs are at the forefront of COVID-19 intervention. Unfortunately, due to highly infected patients with novelty of the virus and the unequipped of hospital to deal with the sudden influx of situations. On 31 December 2019 appear a cluster of pneumonia cases in Wuhan, China, was first reported to the World Health Organization (WHO, 2020). The cause was identified as the novel coronavirus SARS-CoV-2 (Zhu, et al., 2020), and the disease was named "coronavirus disease 2019" (COVID-2019) (WHO, 2020). Since then, the virus has caused an outbreak of viral pneumonia, On 30 January 2020, the WHO declared the outbreak a Public Health Emergency of International Concern (PHEIC) and on 11 March 2020, a pandemic (Ludwig, & Zarbock, 2020).

Covid19 diagnosed by analyzing sputum or the collection of swabs from naso/oropharyngeal samples of lower respiratory

tract secretions. Laboratory studies to identify the novel virus involve different techniques as the use of real-time polymerase chain reaction and partial or total sequencing of the viral genome. To confirm the disease, perform molecular biology tests are necessary to that detect viral RNA. Cases with severe symptoms should be referral to hospital for isolation and treatment. Individuals with mild symptoms should be followed at the primary health care level and should be advised to home isolation (zhang, etal, 2020).

ICU team play a vital role not only in the care of infected patients but also in ensuring that prevention by control measures are implemented in acute setting. As primarily initial surveillance activities focus on severe acute respiratory syndrome with covid 19. Additional including the implementation of central disease center instructions as nurse directed triage protocols. (Burrer, et al, 2020).

Coivd-19 infection among ICU health workers and the risk factors for a negative outcomes is important not only for risk factors for infection, virus transmission patterns and, but also for future infection of ICU team and

other patients, for informing and updating infection prevention and control measures at hospitals ,health facility , and for reducing secondary transmission of covid virus within acute settings (**Fagbo, et al, 2015**).

Currently, spread of covid-19 infection in intensive care settings is not clear – nor is it clear whether there are certain risk factors associated with infection in health workers. The following study has been designed to describe the extent of health care workers compliance with preventive measures and to identify risk factors for infection among ICU health workers. (**Boskoski et al, 2020**).

Magnitude of the study

Various studies declare COVID-19 causes morbidity and mortality rates. Different countries reports revealed e.g., Spain (13.6%),China (3.8%), the United Kingdom (14%) and Italy (11%). The causes of such difference could not be accurately justified in the absence of national reports of infected cases among HCPs. Moreover, the availability of PPE resources are limited , as is the case in many healthcare facilities in Egypt, may have redound to the higher frequency of COVID-19 among HCPs. Nevertheless, the virus mutated and high rates are alarming. (Islam, et al, 2020). However, infection control measures remnants the greatest weapon for protecting ICU healthcare workers against the COVID-19 (**Cascella, Rajnik, Cuomo, Dulebohn, & Di Napoli, 2020**). Therefore, this study was conceded to address this matter.

Aim of the study

This study aim to describes the health care workers compliance with preventive measures for covid-19 in ICUs.

Research questions

Are health care workers compliance with preventive measures for covid-19 in ICUs?

Materials and method

Materials

Study Design

This research utilized a prospective cross-sectional study design

Study Area

The study was carried out on all intensive care units at Assiut University Hospitals.

Egypt. These units include (5 ICU) general ICU (16 beds in four separated rooms) 4 physician ,15 radiological technician ,8 head nurses, 40 nurses, 4 assistant nurses, nurse patient ratio 1:3) , trauma ICU (16 beds in three separated rooms , 3 physician, 5 head nurses, 28 nurses, 6 assistant nurses , nurse patient ratio 2:3), chest ICU (16 beds in three separated rooms , 3 physician ,7 head nurses,40 nurses, 1 assistant nurses ,nurse patient ratio 1:3), Post-operative ICU (12 beds in three separated rooms , 3 physician ,2 head nurses, 35 nurses, 4 assistant nurses ,nurse patient ratio 1:2) and Obstetric ICU (11 beds in two separated rooms , 3 physician ,2 head nurses, 20 nurses, 4 assistant nurses , 5 radiological nurse patient ratio 1:2).

Participants

The target population of this study was all HCW with laboratory-confirmed COVID-19 infection. The study population includes physicians, Registered nurses, Assistant nurse, nurse technician and Radiology/x-ray technician with COVID-19 infection working on all intensive care units (trauma=19 , Chest=15, General =12, Post-operative=12 Obstetric=22 ICUs) at Assiut University Hospitals. The total number of laboratory-confirmed COVID-19 infected HCW was 80 during the period of data collection. All health care workers received a cumulative training of standard and additional precautions at health care facility

Tools of data collection

Two tools used to collect the necessary data, First tool, structured questionnaire with closed- ended questions designed by the WHO to assess potential risk factors for COVID-19 among HCWs. The questionnaire consisted of three main parts, of which the first determined the sociodemographic characteristics of the participants, including age, gender, place of work, occupation.

The second part included clinical assessment and pre-existing medical conditions of HCW infections with corona virus, clinical assessment as fever, respiratory symptoms, gastric symptoms or others symptoms. pre-existing medical conditions as pregnancy, obesity, smoker and diabetes

The third part explored risk factors, Risk factors for HCW infections with corona virus assessment sheet:- This tool was developed with reference to previously published reports [20–23] and was made available in both English and Arabic languages, it involve a list of reasons for developing corona virus infection as exposure type (providing care within one meter, performing or assisting AGPs, direct contact with an environment in which a COVID-19 patient received care and prolonged face-to-face exposure) and IPC measure factors.

Tool two: Adherence to infection prevention and control measures and the availability of personal protective equipment (PPE). The original English-language questionnaire was translated into Arabic, it was assessed using 10 questions ‘Always as recommended, Most of the time , occasionally and rarely based on the WHO and national guidelines on COVID-19 prevention. These included the following: (1) follow recommended hand hygiene practices (1); use alcohol-based hand rub or soap and water before touching a patient (2)/ before cleaning/aseptic procedures;(3) use alcohol-based hand rub or after touching soap and water after (risk of) body fluid exposure;(4)/ a patient (5) after touching a patient surrounding (6) perform hand hygiene before contact with the patient materials, (7) follow IPC standard precautions when in contact with any patient (8) wearing gloves, did you remove them after contact with the patient’s materials, (9) and wear PPE when indicated? according to the risk assessment (10).

The content validity tool was assessed by 5 experts in critical care and emergency nursing field and the content validity index was 0.88._ Reliability of tool was assessed using Cronbach Alpha to test the internal consistency $r = 0.9$.

Data Collection Procedures and Instruments

Permission to conduct the study was obtained from the responsible hospital authorities after explaining the aim and nature of the study.

A pilot study was carried out on 11 HCPs to ensure acceptability, feasibility, face validity and applicability of the tools, the questionnaire and they were excluded from further study

analysis. Modifications were made to avoid any ambiguity.

Data were collected using a self-administered, valid, structured questionnaire with closed- ended questions designed by the WHO to assess potential risk factors for COVID-19 among HCWs.¹³ and Adherence to infection prevention and control measures and the availability of personal protective equipment (PPE). Each participant was contacted individually by the researchers; the questionnaire was distributed to the participants electronically using a web-based mobile application (WhatsApp Messenger, Facebook Inc.). the participant back the questionnaire during one hours. The researcher was available online to explain any question. All health care worker diagnosed with CVID 19 during period from March 2019 to February 2020.

Ethical Considerations

The study was conducted in compliance with the **Declaration of Helsinki**. The study received ethical approval from Ethical Committee in the Faculty of Nursing. Written informed consent was obtained from study participant that were willing to participate in the study, they would have the right to refuse to participate and/or withdraw from the study without any rational any time. Only those participants who volunteered to participate in the research were approached to complete the questionnaires. Study subject privacy was considered during collection of data. Confidentiality and anonymity will be assured.

Data Processing and Analysis

Data were cleaned, coded and entered, and all statistical analyses were performed using SPSS version 25.0. Results were presented in percentages and numbers of the variables

Results

A total of 80 (33.88%) HCPs out of 242 with confirmed COVID-19 were described in the current study. Relevant socio-demographic data of health care workers are summarized in **Table 1**. They were 25 (31.3%) less than 25 years and 34 (42.5%) more than 30 years. Vast majority of participant have recovered from the disease (98.8%) and One of them died from COVID 19 in the period of the study. 96.25 %

from HCW were home isolation .The majority of health care workers 69 (76.2%) females. sixteen (20%) were medical doctors, 48 (60 %) were registered nurses, 6 (7.5%) were assistant nurse, 10 (12.5%) were radiology technician.

Table (2) shows Distribution of Adherence to infection prevention and control (IPC) measures information. The high percent of healthcare workers (82.5%) always use alcohol-based hand rub or soap and water after touching a patient, (70%) follow recommended hand hygiene practices, 60% use alcohol-based hand rub or soap and water after (risk of) body fluid exposure and (58.8%) follow IPC standard precautions when in contact with any patient. More than half (56.3) of participant occasionally use alcohol-based hand rub or soap and water before touching a patient, and (40%) use alcohol-based hand rub or soap and water after touching a patient's surroundings while 42.5%) most of the time wear PPE when indicated.

Table (3) show exposures of health care worker to COVID-19-infected patient, more than half of participants had close contact with the patient (60%) Prolonged face-to-face exposure for more than 15 minutes (58.3%) , wearing a N95 mask (6.2%), presenting for any

aerosolizing procedures performed on the patient (71%), coming into contact with the patient's materials, (72%), as Medical devices used on the patient (58) or contact with body fluids through the tools used for the patient (62.5%), removing gloves after contact with the patient's materials (61.3), performing hand hygiene after contact with the patient's materials (12.5%), having direct contact with the surfaces around the patient(76.3%).

Table 4. Shows healthcare worker's symptoms with corona virus disease (COVID-19). They were 56 (70%) of participant that had fever. The majority of health care workers respiratory symptoms; 73 (91.3%) had cough and 68 (85 %) had sore throat, followed by shortness of breath 62(77.5%) and runny nose 52(65%). The general presentation of participant usually present with fatigue (100%), Loss of appetite (92.5%), Headache (87.5%), Muscle and Joint aches (80%), Chills (75%), Loss of smell (anosmia) or taste (70%) and vomiting(65%) With regards to pre-existing medical conditions, 20 (25%) participants reported being obese, 2 (2.5%) having diabetes mellitus and 5 (6.3%) were pregnant and (5%) were smoker.

Table (1): Distribution of Socio demographic data among Health Care Workers

Socio demographic data among HCW	No	%
Age group		
▪ Less than 25 year	25	31.3
▪ From 25-30 years	21	26.3
▪ More than 30 years	34	42.5
Sex		
▪ Male	19	23.8
▪ Female	61	76.3
Isolation		
▪ In hospital	3	3.75
▪ In home	77	96.25
Occupation in health care facility		
▪ Medical doctor	16	20.0
▪ Registered nurse (or equivalent)	48	60.0
▪ Assistant nurse, nurse technician (or equivalent)	6	7.5
▪ Radiology/x-ray technician	10	12.5

Table (2): Distribution of Adherence to infection prevention and control (IPC) measures information

Adherence (IPC) measures information	Always, as recommended	Most of the time	Occasionally	Rarely
1. Do you follow recommended hand hygiene practices?	56(70.0)	21(26.3)	3(3.8)	0(0.0)
2. Do you use alcohol-based hand rub or soap and water before touching a patient?	9 (11.3)	21(26.3)	45(56.3)	5(6.3)
3. Do you use alcohol-based hand rub or soap and water before cleaning/aseptic procedures?	19 (23.8)	35(43.8)	21(26.3)	5(6.3)
4. Do you use alcohol-based hand rub or soap and water after (risk of) body fluid exposure?	48(60.0)	26(32.5)	6(7.5)	0(0.0)
5. Do you use alcohol-based hand rub or soap and water after touching a patient?	66 (82.5)	12(15.0)	2 (2.5)	0(0.0)
6. Do you use alcohol-based hand rub or soap and water after touching a patient's surroundings?	11(13.8)	16(20.0)	32(40.0)	21(26.3)
7. Did you perform hand hygiene before contact with the patient materials	5(6.3%)	44 (55%)	31(38%)	0(0.0)
8. Do you follow IPC standard precautions when in contact with any patient?	47(58.8)	28(35.0)	5(6.3)	0(0.0)
9. If yes and you were wearing gloves, did you remove them after contact with the patient's materials?	49(61.3)			
10. Do you wear PPE when indicated? according to the risk assessment	29(36.3)	34(42.5)	17(21.3)	0(0.0)

Table (3): Distribution of exposures health care worker to COVID-19-infected patient

Exposures health care worker to COVID-19-infected patient	No	%
1. Have you had close contact with the patient (within 1 metre) since their admission?		
Yes	48	60.0
No	32	40.0
2. If yes, for how long each time?		
5–15 minutes	20	41.7
> 15 minutes	28	58.3
3. If yes, did you have prolonged face-to-face exposure (> 15 minutes)?		
Yes	28	58.3
No	20	41.7
4. If you were wearing a medical mask, what type:		
Surgical Mask	75	93.8
N95	5	6.3
5. If you were wearing gloves, did you remove them after contact with the patient?		
Yes	80	100.0
6. If yes, were you present for any aerosolizing procedures performed on the patient?		
Yes	57	71.3
No	23	28.8
7. Have you had direct contact with the patient's materials since their admission		
Yes	61	76.3
No	19	23.8

Exposures health care worker to COVID-19-infected patient	No	%
8. If yes, which materials?		
Clothes	34	42.5
Medical devices used on the patient	46	57.5
9. If yes, how many times since their admission		
1	42	52.5
2	27	33.8
3	9	11.3
4	2	2.5
10. If yes, did you come into contact with the patient's body fluids through the tools used for the patient		
Yes	50	62.5
No	30	37.5
11. If yes, did you perform hand hygiene after contact with the patient's materials?		
Yes	10	12.5
No	52	65.0
Unknown	18	22.5
12. Have you had direct contact with the surfaces around the patient		
Yes	61	76.3
No	19	23.8

Table (4): Number and percentage distribution of Healthcare workers pre-existing condition and symptoms with (COVID-19)

Distribution of HCW pre-existing condition and symptoms with (COVID-19)	No	%
Health worker symptoms		
Fever (? 38 °C) or history of fever	56	70.0
Respiratory symptoms		
Sore throat	68	85.0
Cough	73	91.3
Runny nose	52	65.0
Shortness of breath	62	77.5
Gastric symptoms		
Nausea or vomiting	57	71.3
Diarrhea	31	38.8
Other symptoms		
Conjunctivitis	15	18.8
Muscle and Joint aches	64	80.0
Loss of appetite	74	92.5
Loss of smell (anosmia) or taste	56	70.0
Fatigue	80	100.0
Chills	60	75.0
Headache	70	87.5
Health worker pre-existing condition(s)		
Pregnancy	5	6.3
Obesity	20	25.0
Diabetes	2	2.5
Smoker	4	5.0

Discussion

The study describes factors and adherence for HCW confirmed COVID-19 were described in the current study. The current study mention that about one third of HCWs aged less than 25

years and while more than one third of them aged more than 30 years. the most of participant were female. The most majority of participant have recovered from the disease and One of them died from COVID 19 in the period of the study. **Ran et al., 2020** documented that

females were most infected HCWs in ICU; this was to be expected, as women represent the majority of nursing staff in Oman. In addition, the majority were less than 45 years of age.

The present study reveal that the most majority of HCWs isolated in their home. This agree with Lai et al 2020 who mentioned the majority of infected HCPs with covid 19 were home isolated. . This might show that treating patients with mild symptoms outside a hospital setting with appropriate implementation with guidance from qualified medical professionals could be a reasonable approach to avoid hospital overcrowded.

The current study reveal that more than half of HCWs occasionally use alcohol based hand rub or soap and water before touching the patient, this consistency with Al Abri et al. 2021 who mentioned that the vast majority practice hand hygiene before touching the patient. The researcher explain that due to limited supplies, facilities and increase flow numbers of infected patients.

Overall, about two third of HCPs use alcohol based hand rub soap and water before cleaning /a septic procedures , the vast majority of HCPs use alcohol based hand rub or soap and water after body fluid exposure and after touching the patient. Otherwise, more than two third of participants were wear PPE when indicated; the most of participants had direct contact with patients materials. Alhazzani et al.,2020 mention that HCWS should follow the universal precaution policies already in place at their institutions. And following recommendations and suggestions as considerations rather than a requirement to change institutional infection control policies due to believes and norms and sympathy expensive supplies

Preventive measures against covid19, more than half of HCWs had closed contact with one meter, prolonged face to face exposure, only 6.3%were wear N95% mask. The lack of personal protective equipment (PPE) is associated with anxiety and fear experienced by the ICU team (**Shen et al., 2020;., 2020; Blake et al., 2020**). In this circumstance, the release of PPE and screening tests were restrictive measures and interpreted by second-line nurses as a discriminatory act

(Maben and Bridges, 2020). Through voluntary initiatives and governmental efforts, physicians have actually been communicated by free phone consultations and monitoring isolated at home in Egypt Through voluntary initiatives and governmental efforts, physicians have actually been communicated by free phone consultations and monitoring isolated at home in Egypt.

The current study found that more than half of participants had close contact home isolated patients and prolonged face-to-face exposure for more than 15 minutes the most participant coming into contact with the patient's materials, as contact with the patient's materials, and having direct contact with the material around the patient. This underscores the emergency need to apply additional universal control measures, e.g., implementing a local effective strategy for screening HCPs in contact with infected patients, prioritizing HCPs for testing. In addition to implementation of preventive measures strategies as a paramount measure to maintain safe environment for patients and HCPs. (**Lai et al., 2020**)

As regards infection of surfaces, WHO reports (**WHO 2020**) declare HCPs are being infected both in the environment of work place and from community, most often through infected family members. CDC documented that household exposure in 27% of cases and healthcare exposure is reported in 55% of cases (**Burrer et al., 2020**). These could include prolonged gatherings with colleagues without flowing necessary measures or contact with contaminated surfaces.

In this study, The high percent of healthcare workers always use hand rub alcohol-based or soap and water after touching a patient, the most participants follow recommended hand hygiene practices, less than two third of participants use alcohol-based hand rub or soap and water after (risk of) body fluid exposure and follow standard precautions when in contact with any patient. More than half of participant occasionally uses alcohol-based hand rub or soap and water before touching a patient.

The extent of silent asymptomatic transmission should be considered very

seriously. Previous studies documented that the pre-symptomatic individuals spread covid -19 infection. (Moghadas et al., 2020) found that patient with asymptomatic manifestations were cause more than half of the overall attack rate in covid-19 outbreaks. The highest number of infected HCPs reported that the infection occurred from ICU, this should be considered in providing more special attention for preventive measures in acute settings. There is a growing interest in identifying other factors of infection among health care personnel.

Our study reported that the most of participant had fever and the majority of health care workers have respiratory symptoms and loss of appetite. Regards to pre-existing medical conditions, less than one third of participants reported being obese, (2.5%) having diabetes mellitus and (6.3%) were pregnant and (5%) were smoker. (Lai et al., 2020) reported similar rates. This may be due to the participants were young and the most of them free any disease. Patients with critical COVID-19 are usually aging, with more frequent chronic diseases. In addition, mild degree can be easily detected by the HCPs with subsequent seeking lab investigation and early treatment.

Comorbidities have been revealed as a major factor for encountering COVID-19. The presence of co-morbidity is a protective factor compared to absence of co-morbidity in acquiring COVID-19 infection. This may reflect redistribution of the comorbid HCPs to health provision places during the pandemic. Most importantly the inadequate hand hygiene and poor adherence to IPC were significant predictors of COVID-19. Though Egypt has a successful national preventive program for more than 20 years. (Yousef et al., 2020) yet there is still inadequate adherence to IPC and hand hygiene practices. Certain national measures should take place on all levels to improve IPC practices, examine and screen all HCPs for clinical signs of COVID-19 at the start of each shift to exclude HCP from work when ill, and avoid HCPs with comorbidities from working acute setting. Strict implementation of training program with reinforcement of IPC teams should be a priority. (Jordan et al., 2020).

Conclusion

This study found that The incidence of infection increase While HCWs followed infection, prevention and control measures., training on adherence to preventive measures were a good predictors of COVID-19, examine all work place team for clinical signs of COVID-19 at the start of each shift and exclude HCPs from work when ill, or have comorbidities from working in acute setting.

Recommendations

1. Vaccinate all health care workers in ICUs
2. Periodical examinations for infected health care workers to document long term covid associated complications
3. Health care facilities should be present over time during covid pandemic.
4. Health care leaders should be conduct training on IPC measures

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