

Factors Associated with Transmission of COVID-19 Infection among Nursing Staff in Kafr Eldawar Fever Hospital 2021

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Abstract

Background: COVID-19 seriousness may result from its pandemic infection from human-to-human transmission and evidence of transmission from animal to human as well. Mainly COVID-19 is transmitted by respiratory droplets while aerosol transmission can occur in specific situation mainly in crowded poor ventilated spaces. This transmission affects individual, health care workers (HCWs), health institutions and the whole community **Aim of the Study:** to identify factors associated with transmission of COVID-19 infection among nursing staff in Fever hospital, Kafr Eldawar, 2021. **Research Design:** Cross sectional research design was used. **Setting:** The present study was conducted at This study was conducted in Kafr Eldawar Fever hospital. **Subjects:** A convenient sample of 104 nurses out of total number of hospital nursing staff (who are on duty, accessible at the time of the study and agreed to participate in the study) is 169 nurses in all hospital units. **Tools:** one tool was developed by the researchers in the form of self-administered questionnaires "factors associated with COVID-19 infection". It consisted of four parts, part I: socio-occupational data, part II: "Factors predisposing nursing staff to COVID-19", part III: "Adherence to infection prevention and control (IPC) measures information" and part IV: "Nursing staff opinions". **Results:** Majority of nurses were directly assigned beds to patients diagnosed with COVID-19, more than two thirds of them worked in a COVID-19 isolation ward and were touching their cheeks, nose, or mouth at work. **Conclusion:** There is significant relation between Participation in in-service training program related to dealing with COVID-19 infection and previous COVID-19 infection and factors predisposing one to COVID-19. **Recommendation:** Well-established hospital information systems (MIS), personal digital assistant (PDA) systems, and a local intranet to avoid unnecessary contact with COVID-19 infection.

Keywords: transmission of COVID-19 pandemic, nurses, infection, prevention and control, predisposing factors

Introduction

Today, there is a universal pandemic communicable respiratory infection started in December 2019 in China called COVID-19, then, the world health organization (WHO) declared the situation as a Public Health Emergency of International Concern (WHO, 2020). The WHO declared it as a global pandemic on March 11, 2020 (WHO, 2020). COVID-19 (Coronavirus) is a part of a coronaviridae family which can infect

human and animals, it is a recent discovered respiratory infection that can cause serious illness among all human in different ages. COVID-19 infection can affect respiration seriously, on the other hand it has dangerous complication on different body systems and organs for example respiratory and cardiovascular systems complications (Gonzalez-Gerez, Bernal-Utrera, Anarte-Lazo, Garcia-Vidal, Botella-Rico, & Rodriguez-Blanco, 2020), (Lim, Woo, Lim, Ng, Chan, & Gandhi, M, 2020).

The common manifestations COVID-19 are fever, dry cough, breathing difficulty, and boredom. Elderly and people with associated medical conditions are the main risk group of catching COVID-19 easier and more serious with progressive complications (Monaghesh & Hajizadeh, 2020).

COVID-19 seriousness may result from its pandemic infection from human-to-human transmission and evidence of transmission from animal to human as well (WHO, 2020). Mainly COVID-19 is transmitted by respiratory droplets while aerosol transmission can occur in specific situation mainly in crowded poor ventilated spaces. This transmission affects individual, health care workers (HCWs), health institutions and the whole community (Wang, Wu, Cheng, Tan, Yang, Zeng et al, 2020) and (Lin, Liu, Gao, Nie, Fan, 2020). Transmission can be from symptomatic or asymptomatic person which was reported by (Rothe, Schunk, Sothmann, Bretzel, Froeschl, Wallrauch et al, 2020) on actual case. This transmission makes noticeable evidence of nosocomial infection among healthcare workers who has work-related COVID-19 activities. All these infections affect the whole community, but infected health care workers are very crucial as they are those who care of the ill and infected patients which affect the whole health system.

COVID-19 infection could be occupational or nonoccupational exposure. Absences, shortage, improper use or non-efficient personal protective equipment including masks, face shield and gowns and lack of proper disinfection procedures are considered as occupational risks. On the other hand, improper hand washing practice, lack of efficient social distances, improper use of surgical mask as needed

and contact with wild animals Huang are considered nonoccupational risks according to Zhuang, Xiong, Deng, Li, and Lai (2020). Hence, HCWs including nurses are in higher risk of COVID-19 infection as they are exposed to both occupational and nonoccupational risks of COVID-19.

It was noticed that touching the eye, nose, and mouth while working are the three common methods of transmission of COVID-19 in which there is direct droplet infection from infected patients during sneezing, coughing or talking who were in close contact with HCWs. Meanwhile Aerosol transmission, where droplets and aerosols from an infected person can remain airborne for certain period of time mainly during closed contact procedures as oral or nasal intubation. These droplets can be transmitted directly or indirectly through different surfaces that are handled by HCWs during different health care practices as illustrated by Wang, Wu, Cheng, Tan, Yang, Zeng et al (2020) in their study about factors of transmission of occupational COVID-19 infection among healthcare staff in Wuhan, China 2020.

Accordingly, proper use of protective personal equipment, strict adherence to standard precautions and required infection control measures can make difference in minimizing HCWs infection according to Nguyen, Drew, Graham, Joshi, Guo, et al (2020).

This HCWs infection is a global significant issue all the time and increased during pandemic COVID-19, it has a demanding need for emergency prevention and management. According to Elhadi, Msherghi, Alkeelani, Zorgani, Zaid, et al (2020) there are actual COVID-19 infection among health

care staff all over the world, even some countries as Libya shut down some hospital due to staff shortage. This proclaims the impact of infected health care staff on global health care activities.

Significance of the study

Identifying COVID-19 infection risk factors among HCWs including nursing staff is the corner stone of eliminating these risks thus, COVID-19 infection among them will decreased. At this time, there will be enough available number of health care staff to care of patients with COVID-19 as well as other patients. On the other, institutional burden of care of infected staff will be minimized. Another benefit of identifying and avoiding these risks is a community benefit where a healthy medical staff will care better and independently of their families thus decreases community burden and improves physical, psychological, functional and social wellbeing of patients, clients, institutions and community at the same time.

Aim of the Study:

The present study aims to identify factors associated with transmission of COVID-19 infection among nursing staff in Fever hospital, Kafr Eldawar, 2021.

Research Design:

Cross sectional research design was used.

Research questions:

What are the factors that associated with transmission of COVID-19 infection among nursing staff in Fever hospital, Kafr Eldawar, 2021?

Setting:

This study was conducted in Kafr Eldawar Fever hospital in Elboheria governorate. It concerns with special diagnoses mainly encephalitis, meningitis, hepatitis, fever, gastroenteritis and bronchitis as they usually related to infectious agents that causes abnormal body temperature elevation and hemodialysis unit for patients with end stage renal disease on hemodialysis. It contains different male and female wards, emergency and hemodialysis units supplied with sterilization unit and technical laboratory for different diagnostic studies. Because of the pandemic COVID-19, the hospital turned into isolation hospital for COVID-19 patients at the time of the study. One of the researches who is from Kafr Eldawar notices a remarkable degree of COVID-19 infection among her colleague within the hospital staff, the researchers were interested in identifying the possible causes of this infection.

Subjects:

A convenient sample of 104 nurses out of total number of hospital nursing staff (who actually on duty, accessible at the time of the study and agreed to participate in the study) is 169 nurses in all hospital units.

Subjects estimation method:

Epi info Program version 7
Population size 169
Expected frequency 50%
Acceptable error 5%
Confidence coefficient 90%
Minimal sample size 104

Tool: After comprehensive review of the related literature, the study tool was developed by the researchers to examine factors that associated with transmission

of COVID-19 infection among nursing staff in Kafr Eldawar Fever hospital. one tool was developed by the researchers in the form of self-administered questionnaires. Tool one "factors associated with COVID-19 infection". It consisted of four parts.

Part I: socio-occupational data which is used to identify age, gender, years of studying nursing, qualification, years of experience and unit of working of the participants. It also contained questions regarding previous participation in in-service training program related to dealing with COVID-19 infection, the need of more training about dealing with COVID-19 infection, sources of information about dealing with COVID-19 infection, associated medical condition and previous infection with COVID-19.

Part II:" Factors predisposing nursing staff to COVID-19" was adopted from **WHO World Health Organization (2020)**; a manual for protecting health workers and responders and from **Ang Y, Wu W, Cheng Z, Tan X, Yang Z, Zeng X et al (2020)** who used the same tool in their study " Super-factors associated with transmission of occupational COVID-19 infection among healthcare staff in Wuhan, China". It contained 14 questions regarding contact or caring of COVID-19 symptomatic or asymptomatic confirmed patients or suspected patients, presence of feverish patient or health staff in working unit, working in COVID-19 isolation unit, touching face during work, proper wearing of surgical mask and personal protective equipment, history of exposure to Huanan Seafood Wholesale Market (within the last month) or wild animal, presence of infected family member or family health care worker.

The scoring system was yes or no responses (yes means presence of the risk and absence of the risk). Each subject will be asked to respond to each item, one mark

will be given to yes answer, zero mark were given to no answer.

Factors predisposing nursing staff to COVID-19 will be measured by the percent of presence of each factor.

Part III and part IV were adopted from **Word Health Organization (2020)**. Protocol for assessment of potential risk factors for coronavirus disease 2019 (COVID-19) among health workers in a health care setting Version: 2.2.

Part III: "Adherence to infection prevention and control (IPC) measures information" contained 8 questions regarding assessment of nursing staff adherence to hand washing and hand rubbing with alcohol, their indications either with patients or required procedures and using protective personal equipment.

The scoring system: was four points Likert scale in the form of Always/ as recommended/ according to the risk assessment, most of the time/ according to the risk assessment, occasionally or rarely. The scoring system was 4 for always, 3 for as most of the time, 2 for occasionally and 1 for rarely.

Part IV: " Nursing staff opinions" contain subjective open-ended questions, it was developed by the researchers after reviewing the related literature to assess nursing staff point of view regarding sources of COVID-19 inside the hospital, the most important protective measures against COVID-19 infection inside the hospital and their suggestions to overcome COVID-19 pandemic with minimal staff infection.

The scoring system was yes or no responses (yes means agree on the risk and no means disagree on the risk). Nursing staff opinions to factors predisposing nursing staff to COVID-19 will be

measured by the percent of presence of each factor.

Method

The study was conducted as follows:

- Permission to conduct the study was obtained from the concerned administrative authorities (the Dean of the Faculty of Nursing, Damanhour University and from the director and the nursing director of Kafr Eldawar Fever Hospital).
- Tool was adopted and translated according to the Egyptian society.
- Content validity for study Tool was reviewed by jury of five experts from Medical-Surgical Nursing, consequently necessary modifications were done.
- Cronbach's alpha test was used to test tool reliability. part II "factors predisposing one to COVID-19" was reliable (0.863). Part III " Adherence to infection prevention and control (IPC) measures information" was reliable (0.978)
- Pilot study was carried out on approximately 10% of the sample (N=11 nursing staff) to test clarity and feasibility of the tools, therefore necessary modifications were done.
- Data collection starts in November 2020 and completed in March 2021.
- The self-administered questionnaire was distributed to the participant for data after explaining the purpose of the study, the researchers explained any misconceptions and the expected time for completing the tool was about 20 minutes.
- Data collection included staff around the day (morning, evening and night by rotation)
- After completion of data collection, the necessary statistical analysis was done.

Ethical considerations:

- An informed consent was obtained from all the participant nursing staff after explanation of the aims of the study and before starting the questioner.
- Confidentiality, anonymity and privacy were assured.
- Participation was on voluntary basis and all the nurses had been told that they had the right to withdraw from the study at any time without any drawbacks.

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean and standard deviation. Significance of the obtained results was judged at the 5% level.

The used tests were :

Chi-square test

For categorical variables, to compare between different groups

Monte Carlo correction

Correction for chi-square when more than 20% of the cells have expected count less than 5

Student t-test

For normally distributed quantitative variables, to compare between two studied groups

F-test (ANOVA): For normally distributed quantitative variables, to compare between more than two groups

Cronbach's Alpha: Reliability Statistics was assessed using Cronbach's Alpha test.

Results

Table (1): shows that most of nurses in this study were female (71.2%), their mean age was (36.20) years, Their mean years of studied nursing was (4.03), more than half of nurses(55.8 %) had Diploma degree in nursing and More than one third of them (33.7 %) were working for more than 20 years. Furthermore the table shows that more than half of nurses (53.8 %) were participated in-service training program related to dealing with Covid-19 infection and most of their response to need more training about dealing with Covid-19 infection (64.4%). More than half (51.0 %) had their information about dealing with Covid-19 infection from hospital training and most of them (58.7 %) didn't have Covid-19 infection.

Table (2): This table clears that more than half of nurses (57.7 %) had infected medical staff in their department, also; more than half of them (51.0%) had medical staff in their department presenting with fever. Majority of nurses (71.2%) were directly assigned beds to patients diagnosed with COVID-19, more than two thirds of them (65.4%) worked in a COVID-19 isolation ward.

Furthermore, more than two thirds of nurses (62.5%) were touching their cheeks, nose, or mouth at work and majority of them (87.5%) wear surgical masks correctly. More than three quarters (83.7%) wore PPE every time as required and followed the specific operational guidelines. Around three quarters of nurses (75.0%) didn't have confirmed COVID-19 case(s) in their family.

Table (3): illustrates that more than half of nurses (54.8%) always follow

recommended hand hygiene practices, more than one third of them (39.4%) always use alcohol-based hand rub or soap and water before touching a patient. Around half of nurses (50.0%) always use alcohol-based hand rub or soap and water before cleaning/aseptic procedures, also more than half of them (55.8%) always use alcohol-based hand rub or soap and water after (risk of) body fluid exposure. More than half (51.0%) always use alcohol-based hand rub or soap and water after touching a patient's surroundings and wear PPE when indicated.

Table (4): shows that (17.3%) of nurses reported that the biggest sources of Covid-19 inside the hospital is respiratory, where (19.2%) reported droplets, (22.1%) reported infected patients, (15.4%) reported direct contact, (11.5%) reported touch. (29.8%) of nurses reported that the most important protective measures against Covid-19 infection inside the hospital is PPE and more than one third (32.7%) reported wearing mask. (19.25%) of nurses suggested PPE and social distance to overcome Covid-19 pandemic with minimal staff infection.

Table (5): shows that there were statistical significant relation between factors predisposing one to COVID-19 and participation in in-service training program related to dealing with Covid-19 infection, needing more training about dealing with Covid-19 infection, and Covid-19 Infection in which ($P= 0.001^*$, 0.009^* , 0.001^*) respectively

Table (6): illustrates that there was a statistical significant relation between adherence to infection prevention and Covid-19 Infection and cardiovascular disease in which ($P= 0.047^*$ and 0.018^*) respectively.

Table (7): shows that there is no statically significant correlation between adherence to infection prevention and factors predisposing one to COVID-19

Table (1): Distribution of the studied nursing staff according to socio-occupational data (n = 104)

Part I: socio-occupational data	No.	%
Age (years)		
20-29	25	24.0
30-39	36	34.6
40-49	32	30.8
50+	11	10.6
Min. – Max.	20.0 – 58.0	
Mean ± SD.	36.20 ± 9.36	
Gender		
Male	30	28.8
Female	74	71.2
Number of years do you studied nursing		
3	58	55.8
5	41	39.4
> 5	5	4.8
Min. – Max.	3.0 – 10.0	
Mean ± SD.	4.03 ± 1.41	
Qualification		
Diploma	58	55.8
Technical	17	16.3
BSC	27	26.0
Master	2	1.9
Years of experience		
<5	16	15.4
5-<10	17	16.3
10-<15	12	11.5
15-<20	24	23.1
20+	35	33.7
Min. – Max.	1.0 – 38.0	
Mean ± SD.	15.72 ± 9.87	
Unit of working		
Wards	28	26.9
Emergency	17	16.3
Dialysis	20	19.2
Sterilization	30	28.8
Lab	7	6.7
Others	2	1.9

SD: Standard deviation

Table (1) (cont...): Distribution of the studied nursing staff according to socio-occupational data (n = 104) “continue”

Part I: socio-occupational data	No.	%
Participation in-service training program related to dealing with Covid-19 infection		
Yes	56	53.8
No	48	46.2
Need to more training about dealing with Covid-19 infection		
Yes	67	64.4
No	37	35.6
Sources of your information about dealing with Covid-19 infection *		
Physicians	26	25.0
Peers	22	21.2
Hospital training	53	51.0
Hospital policy	10	9.6
Bulletin of hospital	1	1.0
Media : TV, radio, internet, magazine, newspaper	8	7.7
Others	2	1.9
Previous exposure to Covid-19 infection		
Yes	43	41.3
No	61	58.7

SD: Standard deviation

*: More than one answer

Table (2): Distribution of the studied nursing staff according to factors predisposing one to COVID-19 (n = 104)

Part II : factors predisposing one to COVID-19	Yes		No	
	No.	%	No.	%
Presence of infected medical staff in your department	60	57.7	44	42.3
Exposure of any medical staff in your department to fever	53	51.0	51	49.0
Direct assignment to beds of patients diagnosed with COVID-19	74	71.2	30	28.8
Working in a COVID-19 isolation ward	68	65.4	36	34.6
Touching your cheeks, nose, or mouth at work	65	62.5	39	37.5
Do you wear surgical masks correctly?	91	87.5	13	12.5
Your self-protection score (This statment only had two options: yes or no. ‘Yes’ meant that the individual wore PPE every time as required and followed the specific operational guidelines. ‘No’ meant that the protective equipment was never worn in accordance with the specific operation guidelines.)	87	83.7	17	16.3
History of exposure to Huanan Seafood Wholesale Market (within the past month)	8	7.7	96	92.3
A recent history of contact with wild animals	6	5.8	98	94.2
Attendance a big party or staying in a crowded place for three hours or more (within the past month)	11	10.6	93	89.4
Traveling to other cities	9	8.7	95	91.3
Presence of any confirmed COVID-19 case(s) in your family	29	27.9	75	72.1
Exposure of any of your family members to Huanan Seafood Wholesale Market	31	29.8	73	70.2
Presence of healthcare workers in your family	52	50.0	52	50.0
Total factors		6.19 ± 3.47		

Table (3): Distribution of the studied nursing staff according to adherence to infection prevention and control (IPC) measures information (n = 104)

Part III: Adherence to infection prevention and control (IPC) measures information	Always		Most of the time		Occasionally		Rarely	
	No.	%	No.	%	No.	%	No.	%
Following recommended hand hygiene practices	57	54.8	17	16.3	29	27.9	1	1.0
Using alcohol-based hand rub or soap and water before touching a patient	41	39.4	32	30.8	30	28.8	1	1.0
Using alcohol-based hand rub or soap and water before cleaning/aseptic procedures	52	50.0	22	21.2	29	27.9	1	1.0
Using alcohol-based hand rub or soap and water after (risk of) body fluid exposure	58	55.8	15	14.4	30	28.8	1	1.0
Using alcohol-based hand rub or soap and water after touching a patient	56	53.8	17	16.3	29	27.9	2	1.9
Using alcohol-based hand rub or soap and water after touching a patient's surroundings	53	51.0	20	19.2	29	27.9	2	1.9
Wearing PPE when indicated (PPE includes: medical mask, face shield, gloves, goggles/glasses, gown, coverall, head cover, respirator (for example, N95 or equivalent) and shoe covers)	53	51.0	12	11.5	35	33.7	4	3.8
Availability of PPE in sufficient quantity in the health care facility	33	31.7	31	29.8	33	31.7	7	6.7
Total Score			25.16 ± 6.84					
% Score			62.91 ± 17.09					

Table (4): Distribution of the studied nursing staff according to health worker opinions (n = 104)

Part V: Health worker opinions	No.	%
The biggest sources of Covid-19 inside the hospital		
Respiratory	18	17.3
Droplets	20	19.2
Infected patients	23	22.1
Direct contact	16	15.4
Touch	12	11.5
Not wearing mask	1	1.0
Medical staff	8	7.7
Every thing	6	5.8
The most important protective measures against Covid-19 infection inside the hospital		
PPE	31	29.8
Alcohol	4	3.8
Hand washing	2	1.9
Mask	34	32.7
Gloves	10	9.6
Infected patients	1	1.0
Mask and Alcohol	6	5.8
hand washing and mask	1	1.0
Mask and Gloves	15	14.4
Your suggestions to overcome Covid-19 pandemic with minimal staff infection		
PPE	20	19.2
Masking	7	6.7
Social distance	20	19.2
Avoid direct contact	17	16.3
Gloving	7	6.7
Infected control	11	10.6
Hand washing	4	3.8
PPE and Hand washing	1	1.0
Masking and Gloving	8	7.7
Masking and Hand washing	9	8.7

Table (5): Relation between factors predisposing one to COVID-19 and different parameters (n = 104)

	Factors predisposing one to COVID-19		t	p
	Min. – Max.	Mean ± SD.		
Participation in-service training program related to dealing with Covid-19 infection				
Yes	0.0 – 14.0	7.18 ± 3.18	3.275*	0.001*
No	0.0 – 14.0	5.04 ± 3.47		
Need to more training about dealing with Covid-19 infection				
Yes	0.0 – 14.0	6.85 ± 3.21	2.681*	0.009*
No	0.0 – 14.0	5.0 ± 3.64		
Previous exposure to Covid-19 infection?				
Yes	0.0 – 14.0	7.81 ± 3.23	4.333*	<0.001*
No	0.0 – 14.0	5.05 ± 3.19		
No	0.0 – 14.0	6.19 ± 3.49		

t: Student t-test**F: F for ANOVA test****SD: Standard deviation*****: Statistically significant at p ≤ 0.05**

Table (6): Relation between adherence to infection prevention and different parameters (n = 104)

	% Adherence to infection prevention and control		t	p
	Min. – Max.	Mean \pm SD.		
Participation in-service training program related to dealing with Covid-19 infection				
Yes	20.0 – 80.0	63.21 \pm 17.78	0.196	0.845
No	30.0 – 80.0	62.55 \pm 16.42		
Need to more training about dealing with Covid-19 infection				
Yes	20.0 – 80.0	64.48 \pm 16.60	1.264	0.209
No	30.0 – 80.0	60.07 \pm 17.81		
Previous exposure Covid-19 infection?				
Yes	20.0 – 80.0	58.95 \pm 17.65	2.011*	0.047*
No	30.0 – 80.0	65.70 \pm 16.25		
Health worker pre-existing condition(s)				
None				
Yes	35.0 – 80.0	59.05 \pm 18.89	1.345	0.185
No	20.0 – 80.0	64.40 \pm 16.23		
Pregnancy				
Yes	55.0 – 72.50	63.75 \pm 12.37	0.070	0.944
No	20.0 – 80.0	62.89 \pm 17.21		
Obesity				
Yes	30.0 – 80.0	68.75 \pm 17.62	1.381	0.170
No	20.0 – 80.0	62.0 \pm 16.92		
Diabetes				
Yes	40.0 – 80.0	63.90 \pm 15.94	0.409	0.683
No	20.0 – 80.0	62.43 \pm 17.71		
Cardiovascular disease				
Yes	40.0 – 80.0	71.33 \pm 13.19	2.544*	0.018*
No	40.0 – 80.0	61.49 \pm 17.32		
Asthma (requiring medication)				
Yes	40.0 – 77.50	65.21 \pm 11.0	0.707	0.488
No	20.0 – 80.0	62.61 \pm 17.75		
Chronic hematological disorder(anemia)				
Yes	20.0 – 80.0	62.05 \pm 19.29	0.176	0.860
No	30.0 – 80.0	63.01 \pm 16.92		
Liver disease				
Yes		77.50	0.857	0.394
No	20.0 – 80.0	62.77 \pm 17.11		

t: Student t-test**F: F for ANOVA test****SD: Standard deviation*****: Statistically significant at $p \leq 0.05$**

Table (7): Correlation between % adherence to infection prevention and factors predisposing one to COVID-19

Factors predisposing one to COVID-19	% Adherence to infection prevention and control	
	r	p
	0.007	0.945

r: Pearson coefficient

Discussion

New Corona virus has become a major threat all over the world (Mhango et al., 2020). For elimination of its risks efficient infection control measures should be applied correctly. Among the most vulnerable groups to this infection is health team workers including nurses, as they are in direct contact with people infected with the Corona virus (Kupferschmidt, 2020). Identification of their risk of this infection can minimize COVID-19 among all health team.

In Egypt, by the beginning of April of 2020, there were over 800 confirmed cases of COVID-19, with more than 50 fatalities, and a rapid tendency towards increase. (WHO, 2020). This rising number of cases, unpreparedness, lack of vital resources, excessive workload, and the inability to contain the spread has caused fear and anxiety among the public, including physicians, residents, fellows, and all health-care workers. (Abdelghani et al., 2020).

The results shows that more than half of nurses were participated in-service training program related to dealing with COVID-19 infection and most of their response need more training about dealing with COVID-19 infection. Also, most nurses had their information about dealing with COVID-19 infection from hospital training. This result attributed to the fear of nurses from infection with COVID-19 and most of nurses try to

protect their health from the infection with COVID-19. this results agreed with those of (Ho et al., 2020), where they reported that, **During outbreaks or pandemics**, human fear arises from the anxiety about a disease of an unknown cause and possible fatal outcome, especially when infection control techniques such as isolation are applied to protect the community (Person et al., 2004). Important Issues that face nurses who respond to COVID-19 are medical risks such as injuries, infection, and depression, which might be related to nurses' anxiety about their health due to infection and stress concerning the workload associated with patients with COVID-19. Also nurses feel anxiety due to worries about their families and children (Martin, 2011)

The most important factors predisposing one to one to COVID-19 infection includes infected medical staff in the department, the medical staff in the department presenting with fever. Also, the nurses were directly assigned beds to patients diagnosed with COVID-19, contact of nurses with patients in isolation ward. These results agreed with those of (Arshad et al., 2020) **where they reported that**, the virus is principally transmitted by respiratory droplets and close contact. Despite the shortage of medical staff specialized in the management of infectious diseases, health care providers, particularly nurses, are at the front lines exerting great and continuous efforts to face and manage the

increased numbers of patients infected with COVID-19 virus infection.

The results cleared also, that the main guidelines for prevention of infection among nurses includes prevention of touching cheeks, nose, or mouth at work and the nurses wear surgical masks correctly. Also, we take the PPE every time as required and followed the specific operational guidelines. Also, health care measures must be taken and confirmed by nurses among their have confirmed COVID-19 case(s) in their family. Unfortunately, the results cleared that, the mask used in hospitals in Egypt is not identical with the methods of control the infection of COVID-19 because the hospital's capabilities with the number of people infected with COVID-19 are large. Also, the use of disinfectants is not available because of its high price, and therefore its use by the nursing team among their families will not be in the correct way as it does not conform to the standards of control the infection. This results agreed with the results of (Arshad et al., 2020), where they reported that, the preventive measures must be taken by nurses for protection their self and their families against COVID-infection.

While, our results on the distribution of the studied nursing staff according to adherence to infection prevention and control (IPC) measures information cleared that, most of nurses always follow recommended hand hygiene practices, as using alcohol-based hand rub or soap and water before touching a patient, also, use alcohol-based hand rub or soap and water before cleaning/aseptic procedures, also before body fluid exposure and after touching a patient's surroundings as well as wear PPE when indicated. This result due to fear of nurses to be infected by COVID-

19 and try to protect themselves by adherence to infection prevention. This results in agreement with those of (Abdelhafiz, et al., 2020) where they showed that participants working in COVID-19 isolation hospital must take a preventive measures like the using of alcohol and soap for prevention of infection with COVID-19 and also for protection of the community and their families.

Our results indicated that, the nurses considered the biggest sources of COVID-19 inside the hospital is respiratory sources, mainly droplets, infected patients, direct contact, reported touch. Most of nurses reported that the most important protective measures against COVID-19 infection inside the hospital is PPE and wearing mask are main method for prevention of infection, also, nurses suggested social distance to overcome COVID-19 pandemic to minimize staff infection. **Also/in the same line, (Arshad et al., 2020), reported that,** the virus is principally transmitted by respiratory droplets and close contact. Despite the shortage of medical staff specialized in the management of infectious diseases, health care providers, particularly physicians especially nurses, are at the front lines exerting great and continuous efforts to face and manage the increased numbers of patients infected with COVID-19 virus infection.

The results cleared that there is a significant relation between factors predisposing one to COVID-19 and participation in-service training program related to dealing with COVID-19 infection, needing more training about dealing with COVID-19 infection. These results confirm the constant need for training courses in order to stimulate the use of control measures to combat the

infection, because with the continued presence of infected cases, it leads to some apathy and indifference to the reality of the events resulting from infection with COVID-19, so we see this in the responses of the nursing team. These results agreed with the results of (Abdelghani et al., 2020), where they reported that, good training on the methods of prevention of COVID-19 infection like PPE application and wearing mask, also use alcohol-based hand rub or soap and water before cleaning/aseptic procedures, before body fluid exposure and after touching a patient's surroundings will decrease the incidences of infection with COVID-19. This result mean that nurses in this study try to follow infection prevention measures according to hospital resources as they try to minimize their exposure to infection. This result in line with (Majeed et al. 2020) who found in their study that health care team has a responsibility to assess and manage risk of potential workplace hazards. An assessment of workplace factors should include measurement of exposure to help identify who may run into the hazard in their work environment which includes environmental hygiene, increased environmental cleaning, social distancing, and hierarchy of other control measures, including eliminating risks if possible. Nurses' understanding of risk will vary, as will their willingness to engage in a work activity that they perceive to be hazardous (European Agency, 2020).

Our results cleared that, there is no statically significant correlation between adherence to infection prevention and factors predisposing one to COVID-19. This result mean that most nurses are less familiar with the concept of workplace risk assessment that are necessary for effective decision making. Also, the use

of infection measures by the nurses in this study are limited to the hospital resources which are not adequate to get ride the infection. Also, these results attributed to the degree of infection differ according to the degree of hygienic measures applied and precautions taken for prevention of infection. So, this indicated the requirements of application of a good training program for prevention of COVID-19 among nurses in hospitals (Li et al., 2020).

Conclusion:

Our study concluded that, nearly half of the studied nurses had COVID-19 infection, COVID-19 virus is principally transmitted by respiratory droplets, close contact with the patients. The health care providers, particularly nurses, are at the front lines exerting great and continuous efforts to face and manage the increased numbers of patients infected with COVID-19 virus infection. Good training program on the methods of prevention of infection is required for decreasing the infection level with COVID-19. Associated risk factors of COVID-19 among Fever hospital nursing staff includes infected medical staff in the department, direct assignment to beds of patients diagnosed with COVID-19, working in a COVID-19 isolation ward, touching one's cheeks, nose, or mouth at work and presences of healthcare workers in one's family. There is significant relation between Participation in in-service training program related to dealing with COVID-19 infection and previous COVID-19 infection and factors predisposing one to COVID-19.

Recommendations:

- Continues updated training for nurses including popper use of personal protective equipment, hand hygiene,

adherence to infection prevention and control measures efficient disinfection and sterilization, medical waste management, and management of occupational exposure.

- Provide early detection and isolation system for any health care workers.

- Provide mass media instruction through national television, social media, hospital Bulletin Boards regarding improper practice that increase risk of cross infection as touching face and eating during work.

- Well-established hospital information systems, personal digital assistant (PDA) systems, and a local intranet to avoid unnecessary contact.

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