Prevalence and Risk Factors of COVID-19 among Health Care Workers in Rizgary Teaching Hospital in Erbil City/Iraq

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Abstract

Background and objective: The global disease COVID-19 is spreading quickly, according to the World Health Organization. Treating a significant number of patients puts healthcare workers globally at high risk of contracting COVID-19. This study aims to determine the prevalence of COVID-19 infections among healthcare workers and explores associated risk factors.

Methods: A cross-sectional study was conducted among healthcare workers at Rizgary Teaching Hospital in Erbil City from September 2022 to September 2023. A sample of 500 participants was selected by systematic random sampling method. A well-designed questionnaire was used to collect information on the prevalence of COVID-19 by dedicating a question in the questionnaire asking if they got COVID-19 infection or not and if yes what was the method they used for diagnosis confirmation, such as PCR testing, blood tests, symptomatic assessment, or radiological examinations as well as identify the risk factors associated with COVID-19 infection in healthcare workers.

Results: The study showed that out of 500 participants, 48.2% were males and 51.8% were females, with a male-to-female ratio of 1.0:1.07. The prevalence of COVID-19 infection was found to be 69.4%. The occurrence of COVID-19 infections was highest among obese, married healthcare workers, and older age groups (p value≤0.001). The majority of healthcare workers had received the COVID-19 vaccine.

Conclusions: The prevalence of COVID-19 infection was high among healthcare workers, especially among those with comorbidities. One of the crucial matters is planning for protective strategies that should be handled during the epidemic of COVID-19 or any other infectious diseases among healthcare workers.

Keywords: COVID-19, Health care workers**,** Prevalence, Risk factors, SARS-CoV-2 virus

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Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes COVID-19 and has been identified as a worldwide health threat. In December 2019, there were reports of COVID-19 cases in the city of Wuhan in central China. [1, 2] The outbreak immediately showed the characteristics of human-to-human transmission. [3] According to the WHO, up to December 31, 2023, the reported cases globally had been recorded at 773,449,299, and 6,991,842 reported COVID-19 deaths. In Iraq, up to December 31, 2023, reported cases were 2,465,545. The reported COVID-19 deaths were 25,375 .[4] Healthcare workers (HCWs) are crucial to a health system's capacity to respond to external shocks like outbreaks, and since they are frequently the first to respond to outbreaks, they are usually at very high risk. An adequate number of HCWs is essential in providing patient care during the ongoing COVID-19 pandemic.[5] HCWs may get SARS-CoV-2 at work through direct or indirect contact with infected patients or other healthcare professionals, as well as through continuous community transmission.[6] In an early case series from Wuhan, China, 29% of the SARS-CoV-2 patients were HCWs, considered to have acquired the infection in the hospital.[7] In the current pandemic, the prevalence among HCWs varies between countries from 2–30%.[8] HCWs are required to work long hours under intense pressure with frequently insufficient resources during an outbreak while facing the risks associated with close contact with COVID-19 patients. Like everyone else, HCWs are susceptible to both the virus itself and misinformation and false data that inevitably increase their anxiety.[9–11] One of the most important precautions for preventing infection is maintaining good hand and material hygiene, which helps slow disease transmission.[11] Healthcare systems are required to adhere to novel standards for personal protective equipment (PPE) and infection prevention and control (IPC) procedures, even though some of them are already under stress and struggling to manage healthcare environments.[12] Therefore, this study aims to assess the prevalence of COVID-19 and determine the factors associated with COVID-19 infection in HCWs exposed to patients to find out the prevalence and risk factors of COVID-19 infection among healthcare workers in Rizgary Teaching Hospital.

Patients and methods

A cross-sectional study has been conducted among healthcare workers at Rizgary Teaching Hospital from September 10, 2022, until September 20, 2023. The data was collected on duty at Rizgary Teaching Hospital (physicians, residents, pharmacists, nurses, laboratory staff, administrative staff, service workers, and others).Epi Info (Version 7) was used to calculate a sample size with a confidence interval of 95%, a 5% degree of precision or allowed error of the expected proportion, an estimated frequency of 50%, and a population size of 2130 in Rizgary Teaching Hospital. The estimated sample size was 325. However, we decided to choose more than this number to overcome a non-response rate, finally, we collected 500 participants out of 2130 healthcare workers (HCWs) by systematic random sampling method after obtaining the interval by dividing the total population of HCWs on sample size [2130/ 500= 4.26], so we chose every 4th HCWs from the list obtained from record department of the hospital while the random starting point was 13.The study was approved by the Research Scientific and Ethics Committee of the Kurdistan Higher Council of Medical Specialties. A modified, well-designed, self-administered questionnaire in the English language was used for data collection, while face-to-face interviews were conducted to gather data

from administrative and service workers. The questionnaire is composed of four parts. Part one is concerned with socio-demographic characteristics such as age, sex, blood, smoking history, BMI, years of formal education, occupation, department or ward of your work, hours of work, chronic disease(s), and medical state, including medical comorbidities and medication. Part two includes questions related to risk factors for COVID-19 infection, and the prevalence of COVID-19 by dedicating a question in the questionnaire asking if they got COVID-19 infection or not and if yes what was the method they used for diagnosis confirmation, such as PCR testing, blood tests, symptomatic assessment, or radiological examinations as well as identifying the risk factors associated with COVID-19 infection in healthcare workers since the start of COVID-19 pandemic. The last two parts were obtaining information about the COVID-19 vaccination history and taking infection control measures including questions about PPE. Informed consent was obtained orally.A pilot study was done among 10 HCWs in different fields or departments to assess the validity and comprehensiveness of the questionnaire. Based on their feedback, the questionnaire was understandable and clear. These 10 participants were not included in the real study.The data were analyzed using statistical software for social science (SPSS), version 26, which was used for data entry and analysis. Descriptive statistics were used to calculate the variables' frequencies and percentages, and the Chi-square association test was used for categorical variables. A p-value of ≤ 0.05 is regarded as statistically significant.

Results

The study showed that out of 500 participants, 48.2% were males and 51.8% were females. Most participants were physicians and nurses (23.6% and 25.6%). Regarding the hospital departments, most of them were in inpatient departments 23.8%, consultation 22.0%, outpatient 20.6%, reception 15.0%, and lab 10.6%. Of most healthcare employees 76.8% were scheduled to perform morning shifts. A lesser proportion of healthcare workers had worked during the evening, night, or multiple shifts. Concerning direct patient interaction, most healthcare workers 78.4% reported having direct contact with COVID-19 patients. In contrast, 21.6% of healthcare workers have not had direct patient contact. The study reported that 26.2% of the healthcare workers had chronic disease(s); out of them, 28.0% were diabetic, 31.8% were hypertensive, 8.3% were asthmatic, 7.6% had autoimmune diseases, and 24.2% had other chronic diseases other than those mentioned above, Table (1).

Table (1): Socio-demographic characteristics of healthcare workers in Rizgary Teaching Hospital.

Variables		No.	%
Gender	Male	241	48.2
	Female	259	51.8
Marital status	Single	102	20.4
	Married	398	79.6
Occupation	Physician	118	23.6
	Residence	28	5.60
	Pharmacist	30	6.00
	Nurse	128	25.6
	Laboratory staff	53	10.6
	Service workers	51	10.2

	Administrative staff	69	13.8
	Others*	23	4.60
The department/Ward of your working	Reception	75	15.0
	Consultation	110	22.0
	Inpatients	119	23.8
	Outpatients	103	20.6
	Laboratory	53	10.6
	Intensive care unit	7	1.40
	Kidney dialysis	6	1.20
	Others**	27	5.40
Time of working shift	Morning	384	76.8
	Evening	19	3.80
	Night	15	3.00
	More than one shift	82	16.4
Direct contact with COVID-19 patients?	Yes	392	78.4
	No	108	21.6
Have you had any chronic disease(s)?	Yes	131	26.2
	No	369	73.8
If yes, which disease(s)?	DM♦	37	28.0
	HTN♦♦	42	31.8
	Asthma	11	8.30
	Autoimmune diseases	10	7.60
	Others	32	24.2

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♦DM: diabetes mellitus, ♦♦HTN: hypertension.

In this study, 69.4% had been diagnosed with a COVID-19 infection. The majority were diagnosed by PCR testing 67.0%. There was a spectrum of severity of COVID-19 infections among HCWs, with 39.1% of those infected suffering mild symptoms, 37.9% reporting moderate symptoms, and 13.5% dealing with severe symptoms. In addition, 9.5% of the affected healthcare workers were asymptomatic. Regarding COVID-19 vaccination, an overwhelming majority of HCWs, 86.4%, have received the COVID-19 vaccine, Table (2).

Table (2): Frequency of COVID-19 infection and vaccination status among healthcare workers.

Variables		No.	%
Have you been infected with COVID-19?	Yes	347	69.4
	No	128	25.6
	Don't know	25	5.00
How many times? if (yes)	Once	192	55.2
	Twice	117	33.6
	Others	39	11.2
Diagnosed by	PCR	233	67.0
	Blood investigations	38	10.9
	Symptoms	67	19.3
	Radiology	10	2.90
Source of infection?	Hospital	218	62.6

	Outside hospital	82	23.6
	Others	48	13.8
The severity of the infection	Asymptomatic	33	9.50
	Mild	136	39.1
	Moderate	132	37.9
	Severe	47	13.5
Have you been admitted to the hospital?	Yes	49	14.1
	No	298	85.9
If yes, admitted to	Wards	32	65.3
	RCU	7	14.3
	Others	10	20.4
How long did you stay in the hospital?	Less than 10 days	22	44.9
	10-20 days	12	24.5
	More than 20 days	15	30.6
Did you receive the COVID-19 vaccine?	Yes	432	86.4
	No	68	13.6

In terms of awareness about COVID-19 Personal Protective Equipment (PPE), this study revealed that most HCWs 76.4% were aware of it.Regarding the sources of information on COVID-19 PPE, among those who possessed this knowledge, training courses were the most prominent source 44.2%, followed by self-education 43.6%, and educational processes 12.2%.The satisfaction levels regarding the usefulness of these training courses are notably high 96.0%.Concerning proper usage of COVID-19 PPE, a considerable percentage 70.8% of HCWs reported correct usage. However, it's worth noting that a subset of 13.0% admitted to occasionally using PPE incorrectly; the majority of HCWs 62.4% affirmed that waste disposal was managed well; 22.2% rated waste management as average; and 15.4% rated poorly managed waste disposal, Table (3).

Table (3): Perception of studied participants about the COVID-19 infection outbreak and its preventive measures.

Variables		No.	%
Did you have any information about COVID-19 PPE?	Yes	382	76.4
	No	118	23.6
If yes, what was the source of your information?	Self-education	218	43.6
	Educational process	61	12.2
	Training courses	221	44.2
Did you attend any training course(s) during the outbreak?	Yes	247	49.4
	No	253	50.6
Did you find the training courses you attended useful?	Yes	237	96.0
	No	10	4.00
Have you used COVID-19 PPE properly?	Yes	354	70.8
	No	81	16.2
	Sometimes	65	13.0
How does waste management deposit?	Well	312	62.4
	Average	111	22.2
	Poor	77	15.4

The current study showed a statistically non-significant association (P=0.597) between gender and the COVID-19 infection. However, a statistically significant association was observed between age, marital status, and BMI with the occurrence of COVID-19 infections, P value was <0.001 for each of them, Table (4). The study showed no statistically significant association between blood groups (A, B, AB, and O) and the incidence of COVID-19 infection. Table (4) also showed a statistically significant association (p<0.001) between COVID-19 infection and chronic diseases, which was highest at 84.7% among those with chronic comorbid diseases. The study surprisingly showed a statistically non-significant connection between the proper utilization of COVID-19 PPE and the incidence of COVID-19 infections, in which the infection was lowest among those who didn't use PPE, Table (4).

Table (4): Association between certain socio-demographic characteristics and COVID-19 infection status.

Variables	Have you been infected with COVID-19 infection?				P-value*
	Yes No. (%)	No No. (%)	Don't know No. (%)	Total No. (%)	
Gender					
Male	166 (68.9)	65 (27.0)	10 (4.10)	241 (100.0)	0.597
Female	181 (69.9)	63 (24.3)	15 (5.80)	259 (100.0)	
Age group in years					
<20	6 (54.0)	3 (27.3)	2 (18.2)	11 (100.0)	
20-29	23 (35.9)	34 (53.1)	7 (10.9)	64 (100.0)	
30-39	145 (74.7)	39 (20.1)	10 (5.20)	194 (100.0)	<0.001
40-49	112 (74.7)	34 (22.7)	4 (2.70)	150 (100.0)	
≥50	61 (75.3)	18 (22.2)	2 (2.50)	81 (100.0)	
Marital status					
Single	48 (47.1)	42 (41.2)	12 (11.8)	102 (100.0)	<0.001
Married	299 (75.1)	86 (21.6)	13 (3.30)	398 (100.0)	
BMI					
<18.5	0 (0.00)	9 (90.0)	1 (10.0)	10 (100.0)	
18.5-24.9	91 (57.6)	56 (35.4)	11 (7.00)	158 (100.0)	
25-29.9	183 (76.6)	44 (18.4)	12 (5.00)	239 (100.0)	<0.001
30-34.9	56 (75.7)	17 (23.0)	1 (1.40)	74 (100.0)	
≥35	9 (90.0)	1 (10.0)	0 (0.00)	10 (100.0)	
Chronic disease status					
Yes	111 (84.7)	13 (9.90)	7 (5.30)	131 (100.0)	<0.001
No	236 (64.0)	115 (31.2)	18 (4.90)	369 (100.0)	
PPE usage					
Used	243 (68.8)	99 (28.0)	12 (3.40)	354 (100.0)	
Not used	53 (65.4)	19 (23.5)	9 (11.1)	81 (100.0)	0.013
Sometimes used	51 (78.5)	10 (15.4)	4 (6.20)	65 (100.0)	

*Chi-square test χ^2.

This study revealed that COVID-19 infections were statistically significantly highest among pharmacists 86.7%, lab staff 83%, and physicians 71.2%, (P<0.001), Table (5).

Table (5): Association between certain occupational risk factors with COVID-19.

Variables	Have you been infected with COVID-19 infection?				P Value
	Yes No. (%)	No No. (%)	Don't know No. (%)	Total No. (%)	
Occupation					
Physician	84 (71.2)	28 (23.7)	6 (5.10)	118 (100.0)	
Residence	18 (64.3)	5 (17.9)	5 (17.9)	28 (100.0)	
Pharmacist	26 (86.7)	3 (10.0)	1 (3.30)	30 (100.0)	
Nurse	91 (71.1)	28 (21.9)	9 (7.00)	128 (100.0)	<0.001
Lab staff	44 (83.0)	9 (17.0)	0 (0.00)	53 (100.0)	
Service workers	20 (39.2)	29 (56.9)	2 (3.90)	51 (100.0)	
Administrative staff	46 (66.7)	21 (30.4)	2 (2.90)	69 (100.0)	
Others	18 (78.3)	5 (21.7)	0 (0.00)	23 (100.0)	
Department					
Reception (Administration)	45 (60.0)	28 (37.3)	2 (2.70)	75 (100.0)	
Consultation	74 (67.3)	32 (29.1)	4 (3.60)	110 (100.0)	
Inpatients	83 (69.7)	25 (21.0)	11 (9.20)	119 (100.0)	
Outpatients	75 (72.8)	21 (20.4)	7 (6.80)	103 (100.0)	0.073
Lab	44 (83.0)	9 (17.0)	0 (0.00)	53 (100.0)	
ICU	5 (71.4)	2 (28.6)	0 (0.00)	7 (100.0)	
Kidney dialysis unit	3 (50.0)	3 (50.0)	0 (0.00)	6 (100.0)	
Others	18 (66.7)	8 (29.6)	1 (3.70)	27 (100.0)	

*Chi-square test χ^2.

Discussion

The shock of the COVID-19 pandemic has seriously challenged the capacity of the global public healthcare system. In our cross-sectional study, among 500 participants of HCWs in Rizgary Teaching Hospital/Erbil City, the prevalence of COVID-19 infection was found to be 69.4%. Comparing the current findings is challenging due to the wide variability between studies estimating the prevalence of COVID-19 infection among HCWs. However, a study done in the New York Metropolitan Area among HCWs in 2020 found a prevalence rate of 51.9%,[12] which was less than our study finding. This might be due to inappropriate hospital building infrastructure, a heavy workload, limited high-quality PPEs, and fewer HCWs per patient in the early pandemic in our region.There was a statistically significant association between age and the occurrence of COVID-19 infections, and the prevalence rate increased with advanced age. In contrast to the findings of a study done in Egypt that assessed the role of age in determining the risk of SARS-CoV-2 infection among HCWs, they observed that the majority (89.6%) of COVID-19 infections among HCWs were between 18 and 40 years old. Although there is a variance in age ranges between this study and our study which may account for the different results observed.[13]

The data revealed a significant association between BMI and the prevalence of COVID-19 infection rates. The higher BMI values are linked to a higher infection risk. These results matched research conducted in a central Italian COVID hospital in Italy that showed a BMI > 30 was associated with a markedly greater risk of COVID-19 diagnosis.[14] The current study showed a statistically significant association between marital status and the risk of contracting the COVID-19 infection, which was higher among married participants. This result disagrees with a study conducted in Saudi Arabia that found a statistically non-significant association between marital status and COVID-19 infection. This might be due to limited attention to social distances.[15] The present

study revealed a statistically significant association between the existence of chronic diseases and the risk of getting infected with COVID-19. This finding is in line with a study done in Mexico that found that risk factors such as a history of obesity, diabetes, and hypertension are significantly associated with COVID-19 infection.[16] This study revealed that COVID-19 infection was significantly higher among pharmacists, lab staff, and physicians. In contrast to a study done in Poland at the University Clinical Hospital in Wroclaw, COVID-19 infection was highest among nurses, which might be due to differences in healthcare systems and preventive measures.[17] In terms of awareness about COVID-19 Personal Protective Equipment (PPE), the majority of HCWs had good knowledge. This finding is similar to studies done in Iran[18] and Turkey.[19] Despite a high awareness rate, the study surprisingly showed the infection rate was lowest among those who didn't use PPE. This is inconsistent with a study conducted at the University Hospital (Newark, NJ) and Robert Wood Johnson University Hospital (New Brunswick, NJ) in the United States that reported that PPE use was positively correlated with several patients with confirmed COVID-19, and HCW who reported lower usage of PPE did not appear to have higher rates of infection. These findings might be due to factors consistently associated with the source of HCWs' knowledge and practice: demonstrated competency in donning and doffing, heavy workload, wearing PPE items for long periods, and opening masks during rest time. Lack of adequate training and awareness among HCWs about the use of PPE.[20] Regarding the COVID-19 vaccination (86.4%) HCWs have received the COVID-19 vaccine. This finding has higher rates than the study done in Iraq, where the COVID-19 vaccination rate was (61.7%). This might be due to the higher awareness of receiving the

vaccine among HCWs in our study, in contrast to the study done in Iraq that expressed some hesitancy to accept receiving the COVID-19 vaccination.

Strengths of the study
Provided prevalence rate of COVID-19 infection among health care workers in Rizgary Teaching Hospital as it was one of the COVID-19 infection hospitals during the pandemic. Representative sample size and random sampling method were used.

Limitations of the study
It's a cross-sectional study in which it is difficult to establish the time sequence of events and hence etiology to establish a cause-and-effect relationship or to analyze behavior over a period of time.

Conclusion
The prevalence of COVID-19 infection was high among healthcare workers, especially those with comorbidities. There was a spectrum of severity among COVID-19 infections among HCWs; the majority had mild and moderate symptoms, while fewer had severe symptoms. The infection rate was highest in overweight, obese, older, and married HCWs. Most HCWs received the vaccine against COVID-19. Healthcare facilities should take the necessary precautions and change the working conditions during the COVID-19 pandemic.

Conflicts of interest
The author reports no conflicts of interest.

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