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Assessment of Knowledge, Attitudes, and Perception of Health Care Workers Regarding COVID-19, A Cross-Sectional Study from Egypt

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Abstract

Healthcare workers (HCWs) are at the frontline defense against the coronavirus disease 2019 (COVID-19) pandemic. Inadequate knowledge and incorrect attitudes among HCWs can directly influence practices and lead to delayed diagnosis, poor infection control practice, and spread of disease. This study aimed to assess the knowledge, perception, and attitude of the Egyptian HCWs towards the COVID-19 disease. A descriptive cross-sectional study was conducted in Egypt, among 407 HCWs using a self-administered questionnaire. The mean correct answer rate was 80.4% with a mean knowledge score of 18.5 ± 2.7 out of 24. A positive correlation between knowledge and attitude scores was detected ($r = 0.215$, $p < 0.001$). About 83.1% of our participants reported that they were afraid of being infected with COVID-19, and 89.2% stated that they were more susceptible to COVID-19 infection as compared to others. Unavailability of personal protective equipment (PPE), fear of transmitting the disease to their families, and social stigma were the most frequently reported reasons for increased risk perception. The overall knowledge level of HCWs was generally good especially among physicians. A positive attitude was detected among allied health professionals more than physicians. Risk perception was high among HCWs. Causes of increased risk perception need to considered by the government and the Egyptian Ministry of Health.

Keywords Attitudes · COVID-19 · Health care workers · Knowledge · Risk perception

Introduction

Coronavirus disease 2019, known as COVID-19 is an extremely expanding pandemic caused by a novel human coronavirus; severe acute respiratory syndrome-corona virus (SARS-COV-2), an enveloped single-stranded RNA virus, previously known as 2019-nCov [1–3]. It was first announced in December 2019, among patients with viral pneumonia in Wuhan city, China to become the most important health problem worldwide [4].

There were two previous outbreaks of coronaviruses; SARS-CoV and Middle East respiratory syndrome-corona virus (MERS-CoV) in 2003 and 2012, which resemble the novel coronavirus. Due to the rapid spread of this highly transmitted virus to many countries, WHO declared it as a "public health emergency of international concern" on January 30, 2020. Later, due to the continual rise in the number of affected countries, cases, and fatalities, WHO declared COVID-19 as a global pandemic on 11 March 2020 [5].

SARS-COV-2 is transmitted from person-to-person by close contact (within about 6 feet) via the respiratory secretions in coughs or sneezes or by touching virus-contaminated surfaces or objects. Old age and pre-existence of chronic illnesses have been identified as potential risk factors for severe disease and mortality [6]. The virus incubation period is 2–14 days with the majority of patients (80%) have mild symptoms that do not require medical intervention. About 20% of COVID-19 cases had serious illness as dyspnea, sepsis, septic shock, and organ failure, and can be fatal in about 2% of cases [7]. There is no

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antiviral curative treatment or vaccine that has been recommended for COVID-19.

The WHO recommends prevention of spread by protecting health care workers (HCWs) and patient's close contacts. Primary preventive measures include regular hand washing, social distancing, and respiratory hygiene (covering mouth and nose while coughing or sneezing) [8].

The HCWs are at the frontline of COVID- 19 pandemic defense and are exposed to, not only infection with COVID-19 due to their frequent exposure to infected individuals, but also psychological distress, long working hours, fatigue, occupational stigma and physical violence [9, 10].

The transmission of the disease among HCWs is exaggerated by overcrowding, absence of isolation facilities, contaminated environment and is likely enhanced by insufficient knowledge and awareness of infection control practices among HCWs [11]. That inadequate knowledge and the incorrect attitudes among HCWs can directly influence practices and lead to delayed diagnosis, poor infection control practice, and spread of disease [12, 13].

Understanding HCWs' knowledge, attitudes, and possible perception of risk of infection helps to predict the outcomes of COVID-19 in Egypt. The purpose of the study was to evaluate the knowledge, attitude, and perception of the risk of infection with COVID-19 among HCWs in Fayoum Governorate, Egypt.

Subjects and Methods

A descriptive cross-sectional study was done among a group of HCWs at different hospital types in Fayoum Governorate, Egypt. Data was collected through the 1st week of May from 1 to 7th May 2020, days of partial lockdown to implement social distancing to avoid the spread of the pandemic. Fayoum governorate located to the west of Cairo with a population that exceeds five million. It has one main teaching hospital, one general, infectious disease, chest and insurance hospitals, five district hospitals, and four private hospitals.

Study Subjects

A convenience sampling technique was used to select participants. The sample size was calculated using EpiCalc-2000 based on the following assumption: the proportion of good knowledge 50%, level of confidence 95% and precision 5%, and design effect 1 to be 384.Then the sample size increased by 5% to overcome non-response. Confidentiality precautions were ensured during the data collection process.

Study Tools

A self-administered questionnaire was used, it was developed by the authors after reviewing previously conducted research [14–16], and visiting the Ministry of Health and Population (MOHP) and WHO websites for frequently asked questions [17]. Questions were written in Arabic and were adapted to suit participants. The questionnaire was checked and validated for content and relevance by authors, and two external public health and microbiology professors.

The questionnaire was pretested on 20 HCWs who were later on excluded from analysis; the internal consistency of the study questionnaire was assessed by calculating the Cronbach alpha. The values were 0.750 (knowledge section), 0.712 (attitudes section), and 0.687 for risk perception part in this study.

The questionnaire covered the following: (I) Demographic characters: age sex, hospital, department, education, and source of information about COVID-19. (II) The knowledge section: consisted of 24 knowledge questions covering the main general information, mode of transmission, and ways of disease prevention. Each question was answered by either yes, no, or don't know. Yes was the correct answer to some questions and no for others. (III) The attitude section; included ten questions assessing HCWs' attitudes of COVID-19 as a preventable and controllable disease (four items), and their attitudes towards directions and regulations taken by the Egyptian Government to overcome COVID-19 pandemic situation (six items).

Response to each item was recorded on the 5-point Likert scale as follows: strongly agree (5-points), agree (4-points), undecided (3-points), disagree (2-points), and strongly disagree. Risk perception: included assessment of HCWs feelings towards COVID-19 infection by two statements: (1) I am more susceptible to infection with COVID-19 as compared to others, (2) I am afraid of being infected with COVID-19 virus. The response could be either yes, no, or undecided. Causes of risk perception of more susceptibility to COVID-19 or perception of fear from catching covid19 were encountered.

Data Collection Process

Due to the lockdown in Egypt in this critical situation to achieve social distance, we used the online data collection method. A Google form was created, and participants were invited to complete and submit it. A questionnaire link was shared with groups for HCWs on Facebook and Whatsapp. Additionally, authors have shared the link personally to HCWs in their network areas. The questionnaire was also

printed and distributed by data collectors to HCWs, at the different health care facilities, who cannot reach the Google form. One hundred and fifty-seven (157) questionnaires were completed as Google forms, and 250 were collected as a printed self-administered questionnaire.

Ethical Consideration

The ethical committee of the Faculty of Medicine, Fayoum University has approved the study protocol. Confidentiality of the study participants' identities was maintained throughout the study by making the participants' information confidential and asking participants to give truthful answers. This was voluntary and non-compensated participation.

Statistical Analysis

Once all necessary data were obtained and checked for completeness, they were coded and analyzed using Statistical Package for Social Science (SPSS) software version 16. Simple descriptive analyses as means and standard deviations (SD) were considered for numerical data and number and percent for qualitative data. Chi-square test was used to compare qualitative variables between physicians and allied health workers. Comparing knowledge scores between two groups was done using student t-test, and ANOVA test for more than two groups. Pearson correlation was done between knowledge and attitude scores. Multiple linear regression analyses and logistic regression analyses were performed to identify the factors associated with favorable attitude score and risk perception towards COVID-19 infection. $P \leq 0.05$ was considered statistically significant.

Knowledge score was calculated for the 24 knowledge questions; the correct answer was scored one point and the wrong answer or do not know was scored 0, with the maximum score to be 24. Two attitude scores were calculated: the first one regarding HCWs' attitude toward COVID-19 as a preventable disease (four items, with a maximum score of 20), the other attitude score regarded their attitude toward governmental actions to combat COVID-19 (with a maximum score of 30). These scores were used to be compared between participants according to the characters studied.

Results

Four hundred and seven HCWs from Fayoum Governorate have completed the survey. Table 1 shows the socio-demographic characteristics of the studied participants. Nearly half of the participants (50.6%) were males. Their mean age was 34.95 ± 9.32 years and ranged from 20 to 60 years old. More than one fourth (27.8%) were university graduates, 23.6% had postgraduate studies, and only

Table 1 Basal characteristics of the study group (n = 407)

	N	%
Sex		
Female	201	49.4
Male	206	50.6
Hospital type		
University hospital	245	60.2
General hospital	104	25.6
Primary health care	58	14.2
Age (years)		
20–29	145	35.6
30–39	126	31.0
40–49	96	23.6
≥ 50	40	9.8
Mean ± SD	34.95 ± 9.32	
Education		
Postgraduate	96	23.6
University	113	27.8
Intermediate	94	23.1
High school education	93	22.9
Less than high school education	11	2.7
Professions		
Physician	127	31.2
Nurse	102	25.1
Pharmacist	36	8.8
Technician	26	6.4
Employee	79	19.4
House keepers	37	9.1
Direct contact with patient		
Yes	194	47.7
No	213	52.3
Main source of knowledge on COVID-19		
MOHP and WHO website	110	27.0
Social media	84	20.6
Newspaper	8	2.0
Television	18	4.4
Physicians	118	29.0
Friends/Family	21	5.2
Courses	48	11.8

SD standard deviation, *MOHP* Ministry of health and population, *WHO* World Health Organization, *COVID-19* Coronavirus disease 2019

2.7% had less than high school education. The majority (60.2%) of the study participants were working at the university hospital and the others were from general hospitals (25.6%) or primary health care centers (14.2%). Those who worked in direct contact with patients represented 47.7% of the study group. All participants claimed that the main source of information about COVID-19 was physicians (29%), MOHP website (27%), social media (20.6%).

Other sources included friends or family members (5.2%), courses (11.8%) (Table 1).

Results of knowledge assessment of the participants regarding COVID-19 general information, ways of spread, common symptoms, and measures to prevent the spread of COVID-19 are shown in Table 2. The mean knowledge score of participants was 18.5 ± 2.7 ranged from 9 to 23, with the mean correct answer rate of questions was 80.4%. Correct answers were mostly identified for all items by more than half of participants with a significantly higher percent in physicians than in allied health professionals. The least correct answers were related to the following question: "COVID-19 is transmitted by dealing with domestic animals?" where only 28.5% correctly identified that COVID-19 cannot be transmitted by dealing with domestics animals, also 38% only of participants correctly identified that antibiotic are not the drug of choice for treating COVID-19. About half the participants thought that COVID-19 is always fatal. The preventive measures of COVID-19 were correctly identified by the majority of participants except the faulty

understanding about washing nose with a salty solution as only 20% identified that it has no role in COVID-19 prevention. A knowledge gap was detected between physicians and allied health professionals in most items (Table 2).

The relation between the socio-demographic characteristics and knowledge about COVID-19 is demonstrated in Table 3. Almost similar knowledge mean scores were observed for male and female participants (18.68 ± 2.89 and 18.24 ± 2.56, respectively) with no statistically significant difference. The mean knowledge score was significantly higher in the younger HCWs at age groups (20–30) and (30–39) than those in the older age groups ($p = 0.014$). Physicians then pharmacists had the highest knowledge score than other professions. No difference in knowledge according to the place of work was noted. The knowledge mean scores were significantly related to the level of education as well as to the source of knowledge. Participants with university or higher education had significantly higher knowledge mean scores compared to those with lower levels of education. Additionally, significantly increased knowledge score

Table 2 Knowledge about coronavirus disease 2019 (COVID-19) among healthcare workers ($n = 407$)

	Doctors (=127) N(%)	Allied health care workers (=280) N(%)	Total corrected answers N(%)	p value
COVID-19 is a viral disease	127(100%)	280(100%)	407(100%)	
COVID-19 is transmitted by direct contact with infected persons	127(100%)	260(92.9%)	387(95.1%)	0.001*
COVID-19 is transmitted by dealing with domestic animals	86(67.7%)	30(10.7%)	116(28.5%)	<0.001*
The incubation period of disease is from 2 to 14 days	126(99.2%)	190(67.9%)	316(77.6%)	<0.001*
There is an available vaccine for COVID-19	106(83.5%)	129(46.1%)	235(57.7%)	<0.001*
Antibiotics are the drug of choice in treating COVID-19	91(71.7%)	65(23.2%)	156(38.3%)	<0.001*
The virus may be more dangerous in patients with chronic diseases	126(99.2%)	238(85%)	364(99.4%)	<0.001*
The virus may be more dangerous for the elderly	127(100%)	238(85%)	365(89.7%)	<0.001*
Heath care workers are more more prone to COVID-19	112(88.2%)	248(88.6%)	360(88.5%)	0.911
COVID-19 always causes death	104(81.9%)	99(35.4%)	203(49.8%)	<0.001*
COVID-19 is transmitted by droplets	126(99.2%)	195(69.6%)	321(78.9%)	<0.001*
COVID-19 is transmitted through arthropods	118(92.9%)	145(51.8%)	263(64.4%)	<0.001*
COVID-19 is transmitted through eating contaminated food	89(70.1%)	43(15.4%)	132(32.4%)	<0.001*
Headache, fever, cough, sore throat, and flu are symptoms of COVID-19	127(100%)	267(95.4%)	394(96.8%)	0.012*
COVID-19 leads to pneumonia, respiratory failure, and death	127(100%)	255(91.1%)	382(93.9%)	0.001*
Preventive measures against COVID-19				
Wash hands with soap, water or alcohol	127(100%)	280(100%)	407(100%)	
Avoid touching eyes, nose and mouth	126(99.2%)	280(100%)	406(99.8%)	0.312
Putting on facemask	126(99.2%)	274(97.9%)	400(98.3%)	0.443
Covering the nose and mouth while coughing	125(100%)	272(97.1%)	397(97.5%)	0.731
Avoiding crowdedness in public places	127(100%)	276(98.6%)	403(99.0%)	0.315
Frequently cleaning and disinfecting surfaces	127(100%)	278(99.3%)	405(99.5%)	1
Keep at least one meter distance between people	126(99.2%)	269(96.1%)	395(97.1%)	0114
Washing nose with a salty solution	53(41.7%)	30(10.7%)	83(20.4%)	<0.001*
Avoid direct contact with colleagues (others)	125(100%)	261(93.2%)	386(94.8%)	0.028*

*Significant; *COVID-19* coronavirus disease 2019

Table 3 Relation between sociodemographic characteristics of study participants and their knowledge scores regarding COVID-19 (n = 407)

	±Mean knowledge score	p value
Sex		0.106
F	18.68 ± 2.89	
M	18.24 ± 2.56	
Age		0.004*
20–29	19.02 ± 2.73	
30–39	18.47 ± 2.68	
40–49	17.95 ± 2.69	
≥ 50	17.63 ± 2.7	
Profession		< 0.001*
Physician	21.0 ± 1.4	
Nurse	17.82 ± 2.27	
Pharmacist	19.14 ± 124	
Technician	16.92 ± 1.99	
Employee	16.96 ± 2.18	
House Keepers	15.11 ± 2.42	
Education		< 0.001*
Postgraduate	20.10 ± 1.18	
University	18.62 ± 21	
Intermediate	18.68 ± 2.7	
High School education	18.10 ± 2.96	
Less than high School education	15.00 ± 31	
Direct contact with patients		< 0.001*
Yes	18.9 ± 2.5	
No	17.9 ± 2.9	
Work place		0.114
University hospital	18.29 ± 2.6	
General hospital	18.94 ± 2.6	
Primary health care	18.29 ± 3.38	
Source of knowledge		< 0.001*
MOHP and WHO website	19.3 ± 2.34	
Social media	19.09 ± 2.23	
Newspaper	17.0 ± 2.9	
TV	15.78 ± 3.5	
Physicians	18.00 ± 3.97	
Friends/family	18.00 ± 2.9	
Courses	17.9 ± 1.8	

MOHP Ministry of health and population, *WHO* World Health Organization

*Significant; ±Maximum score = 24

was detected in those working in direct contact with patients than others (p < 0.001).

The attitude of the participants as regards the COVID-19 health problem and the preventive measures considered to limit its spread are presented in Table 4. Although the majority of our participants considered COVID-19 as a severe disease, they agreed that this disease can be prevented.

The vast majority of HCWs agreed that infection control standard precaution can protect against COVID-19 (95.6%), with this percent was higher among allied health workers than physicians. Generally speaking, a positive attitude was more observed among allied health workers than physicians in many attitude items related to the government's role in diagnosis, treatment, and dealing with COVID-19 infections. Nearly forty percent of physicians agreed that the government can overcome the COVID-19 problem and were confident in the information disseminated by the MOHP. Also, allied health workers were more confident in isolation hospitals' ability to treat COVID-19 patients than physicians (66.4% vs 45.7%, respectively; p < 0.001).

The mean attitude score regarding COVID-19 as a preventable disease was 13.7 ± 2.1 and was significantly higher in physicians than allied health workers (14.5 ± 1.9 versus 13.3 ± 2.1, p < 0.001). The attitude score towards the governmental role in COVID-19 management was 20.9 ± 4.3, which was lower for physicians than for allied health workers (19.0 ± 4.7 versus 21.9 ± 3.7, p = < 0.001). Knowledge score was positively associated with attitude score towards COVID-19 as a preventable disease (r = 0.215, p < 0.001). High educational level and younger age were the factors associated with the positive attitudes outlined towards COVID-19 as a preventable disease Table 5.

Regarding risk perception, about 83.1% of our participants reported that they were afraid of being infected with COVID-19, and 89.2% stated that they were more susceptible to COVID-19 infection as compared to others, Fig. 1. The most common statements accepted by participants as causes of perception of fear of COVID-19 infection were the following: fear of transmission of infection to their families (98.5%), the disease is highly transmissible (90.4%), COVID-I9 new disease with no available vaccine (78.6%) or treatment (87%), the fatality of the disease (82.1%), fear of entering COVID-19 isolation hospitals (86.5%), and stigma related to COVID-19 (66.3%) (Table 6). The most common reasons stated by the HCWs justifying their higher susceptibility to COVID-19 infection than others were; the PPE is not always available (83.6%), workplace circumstances as crowdedness (61.4%) and ill ventilation (72%), and the population who do not commit to the preventive measures (75.4%) (Table 6).

Table 7 showed that predictors of perception of higher susceptibility to infection were: younger age, OR (95%CI) 0.666(0.510–0.871); being from allied health workers, 4.970 (2.190–11.278); negative attitude toward disease as a controllable and preventable disease, 0.824(0.706–0.961); and working in contact with patients, 3.358(1.85–6.085). While predictors of fear perception from COVID-19 infections were; young age OR (95%CI) 0.782(0.566–1.079); female sex, 1.969(1.004–3.860); higher education level, 9.624(2.218–41.755); a negative attitude toward disease as

Table 4 Attitudes of healthcare workers regarding coronavirus disease 2019 (COVID-19) (n=407)

	Doctors (=127) ±N(%)	Allied health care workers (=280) ±N(%)	Total (=407) ±N(%)	p value
COVID-19 is a severe disease	108(85%)	244(87.1%)	352(86.5%)	0.565
COVID-19 can be prevented	108(85%)	235(83.9%)	343(84.3%)	0.775
Standard precaution can protect us against COVID-19	116(91.3%)	273(97.5%)	389(95.6%)	0.005
COVID-19 cases will increase	117(92.1%)	213(76.1%)	330(81.1%)	<0.001*
I am confident that Egypt can overcome COVID-19	52(40.9%)	214(76.4%)	266(65.4%)	<0.001*
I am confident in the information disseminated by the MOPH about COVID-19	55(43.3%)	219(78.2%)	274(67.3%)	<0.001*
There are cases recovered from disease	96(75.6%)	223(79.6%)	319(78.4%)	0.358
Regulation taken by the government are enough to combat disease	44(34.6%)	213(76.1%)	257(63.1%)	<0.001*
COVID-19 is accurately diagnosed	30(23.6%)	188(67.1%)	218(53.6%)	<0.001*
I am confident in hospitals dealing with and treating COVID-19 patients	58(45.7%)	186(66.4%)	244(60.0%)	<0.001*

MOHP Ministry of health and population, *COVID-19* coronavirus disease 2019

*Significant; ±Percent represented number agreed or strongly agreed to this statements

Table 5 Predictors of positive attitudes towards coronavirus disease 2019 (COVID-19) as preventable disease by multiple liner regression analysis

| Predictors	Unstandardized coefficients		Standardized coefficients	t	p value
	B	Std. error	Beta		
Constant	16.115	1.436		11.224	0.000*
Age	−0.023-	0.011	−0.101-	−2.061-	0.040*
Gender (female versus male)	0.070	0.201	0.017	0.349	0.727
Health workers (Allied health personnel versus physicians	−0.238-	0.522	−0.053-	−0.455-	0.649
Knowledge score	0.028	0.048	0.037	0.588	0.557
Contact with patient (yes versus No)	−0.118-	0.208	−0.028-	−0.566-	0.572
Education (Postgraduate education versus graduate and lower level)	1.055	0.529	−0.224-	−1.996-	0.047*

*Significant
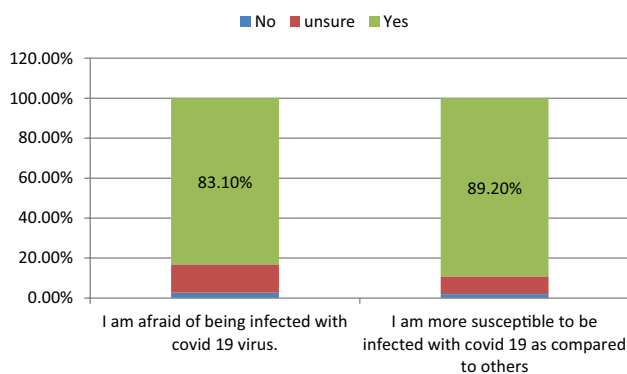
Fig. 1 Risk perception of study participants about COVID-19

a controllable and preventable disease, 0.715(0.585–0.874); and working in contact with patients 2.991(1.485–6.024).

Discussion

The study was conducted during the first week of May 2020, in the middle of the COVID-19 pandemic, and few days after detection of the first confirmed case of COVID-19 in Fayoum Governorate, which is rated now at the middle of June 2020, as the most affected governorate in Egypt. It aimed to assess the knowledge and attitude level of HCWs and to

Table 6 Risk perception towards coronavirus disease 2019 (COVID-19) among healthcare workers (n = 407)

I am afraid of being infected with covid 19 virus	N	%	I am more susceptible to be infected with covid 19 as compared to others	N	%
It is a new disease with unknown treatment	354	87.0	It is a new emerging disease with limited data about it	256	62.9
It is a new disease with unknown vaccine	320	78.6	The PPE is not always available	341	83.8
The disease is highly transmissible	368	90.4	I am not well accustomed to use the PPE	198	48.6
The disease may be fatal	334	82.1	I am not well trained to use the PPE	148	36.4
I could transmit infection to my family	401	98.5	The PPE is not enough to protect from infection	217	53.3
I have comorbidities	176	43.2	The circumstances (crowdedness) in the work place is suitable for transmitting infection	250	61.4
The public stigmatizes those who get infection	270	66.3	Ill ventilation in the work place is suitable for transmitting COVID-19 infection	293	72.0
The health authorities' response is not satisfactory	162	39.8	The public is not committed to the preventive measures	307	75.4
Fear of entering isolation hospital	352	86.5			

COVID-19 coronavirus disease 2019

Table 7 Predictors of increased perception toward coronavirus disease 2019 (COVID-19) by multiple logistic regression analysis

Predictors	I am more susceptible to be infected with COVID-19 as compared to others			I am afraid of being infected with COVID-19 virus		
	p value	OR	95% CI	p value	OR	95% CI
Sex	0.408	0.795	0.461–1.370	0.049*	1.969	1.004–3.860
Age	0.003*	0.666	0.510–0.871	0.134	0.782	0.566–1.079
Health workers (Allied Health personnel versus physicians)	0.000*	4.970	2.190–11.278	0.776	1.168	0.400–3.409
Education (bachelor and high education versus lower level)	0.052	2.007	0.994–4.054	0.002*	9.624	2.218–41.755
Attitude score toward the government role	0.802	0.951	0.644–1.405	0.289	0.786	0.503–1.227
Attitude score toward disease	0.014*	0.824	0.706–0.961	0.001*	0.715	0.585–0.874
Knowledge score	0.128	1.107	0.971–1.262	0.556	1.048	0.897–1.223
Contact with patients (yes/no)	<0.001*	3.358	1.85–6.085	0.002*	2.991	1.485–6.024

OR odds ratio, *95% CI* 95% confidence interval

*Significant; *COVID-19* coronavirus disease 2019

estimate the risk of infection perception among HCWs in health facilities in Fayoum Governorate, Egypt.

According to the official website of the Egyptian MOHP, the total COVID-19 cases were 8962 cases and the total deaths were 488 [18]. And at that time all discovered cases whatever the grade of symptoms were treated at COVID-19 isolation hospitals. In contrast to this, Egypt's Minister of Higher Education and Scientific Research reported in an official presentation on the first of June 2020 that, according to modeling estimates, the actual numbers of cases in Egypt maybe five times higher or around 117,000 cases. Additionally, he reported that the growth rate increased exponentially in the last days of May, rising from 5.4% growth rate on May 21st to 6.2% on May 30th, while during the earlier days of the pandemic in Egypt, the growth rate was around three percent [19].

At the time of writing this manuscript, in the middle of June, the total number of officially confirmed cases was 47,856 cases and 1766 deaths. In the same period, according to the Egyptian Medical Syndicate, the number of infected doctors was about 430 with 68 deaths with a mortality rate of 15.8% that is very high and has to be explained by the authorities [18, 20].

In the current study, the knowledge level of HCWs about COVID-19 was high. The mean correct answer rate was 80.4%. This comes in accordance with studies conducted in China, Vietnam, and Pakistan [14, 15, 21]. Similarly, a Ugandan study had reported about 70% of their respondents had sufficient level of knowledge [22] also in an Iranian study it was found that 99% of respondents had excellent knowledge level regarding the disease modes of transmission but regarding the disease symptoms only 86% had sufficient knowledge [23]. On the other hand in a study from the United Arab Emirates, poor knowledge about the disease transmission, and the symptom was found in a significant proportion of HCWs [24].

Physicians were the most often mentioned as a source of information about COVID-19 followed by the MOHP or WHO official web sites and social media with only small percent reported courses or training as their source of information. This was unlike other studies where social media [15, 21, 24], WHO and the government web sites [22, 25], seminars and workshops were found to be the most common information sources [26].

The participants of this study had a reasonable level of knowledge irrespective of their job, especially regarding the disease preventive measures. Apart from the faulty belief that washing the nose with saline could prevent the infection that was significantly prevailing among physicians, almost all of the HCWs knew the proper disease preventive measures. Adequate knowledge about the disease preventive aspects was found in an Indian study despite the moderate overall knowledge about the COVID-19 infection [27].

Hand washing, refrain from touching eyes, mouth and nose, and putting surgical face mask were among the preventive measures frequently accepted by our participants. Inconsistent to our findings, Kumar et al. [28] found HCWs knowledge regarding the role of face mask in the prevention of the disease to be moderate to poor. Also, Olum et al., [22] found about 17% of HCWs believed that wearing general medical masks was not protective against COVID-19, while Ng et al. [29]. Outlined that surgical masks are similarly as effective as N95 respirators if used with hand wash and other infection prevention precautions. Lately, on the 30th of May, the Egyptian Government has mandated wearing a face mask in public places and at public transportation.

Regarding the knowledge about modes of transmission, symptoms, and treatment of COVID-19, we found that physicians had a significantly higher level of knowledge followed by pharmacists and nurses. This was in similar with other studies [14, 23], while Olum et al. [22] reported no significant difference in the level of knowledge about COVID-19 among HCWs in Uganda irrespective of their professions or qualifications.

Knowledge level about COVID-19 was significantly associated with younger age groups especially 20–30 years and with superior education levels. Several results found younger persons with higher levels of education had higher knowledge [14, 16, 30]. Also, a higher knowledge level was found among HCWs who gained information about the disease from the internet either through social media or MOHP/WHO web site. This could be explained by the fact that younger highly educated persons tend to use the internet than older less educated persons. In Egypt, Age groups between 18 and 40 years, represent more than 75% of Facebook users [31]. This comes in opposite to the Ugandan study findings where the HCWs who gained information from the traditional news media like TV, radio, and the newspapers had more knowledge [22].

We also found that being in direct contact with COVID-19 patients significantly increases the knowledge level as direct dealing with patients make HCWs more motivated to know about the disease and to search for scientific materials and guidelines [14].

Our results revealed an overall positive attitude of HCWs towards COVID-19 as a preventable disease. We also found that good knowledge was significantly associated with this positive attitude. This parallels several studies that found an association between the knowledge level of HCWs about COVID-19 and their attitude [14, 15, 21]. Even the studies that included the general population, reported that a higher knowledge level was associated with a positive attitude [16, 30]. It is well known that knowledge of HCWs is a very important prerequisite for prevention beliefs, positive attitudes, and to promote positive practices. It also affects their coping strategies to some extent [13]. Inadequate knowledge with other factors, as type and frequency of exposure, could increase the risk of infection [32]. The attitude towards COVID-19 as a preventable disease was also higher among physicians than other HCWs. This was consistent with Zhou et al. [14] who found that frontline HCWs as physicians who deal directly with patients had a more optimistic attitude. On the other hand and contrary to their higher knowledge levels, we found physicians had a less favorable attitude regarding the COVID-19 situation in Egypt and the governmental role in its prevention and control.

As the health sector comes in the first place as regards the risk that entails its employees, reducing this risk is the first step in providing quality healthcare. The HCWs risk perception could strongly affect not only their mental health but also their exposition to this risk [33, 34]. It worth mentioning that, and despite their high knowledge score, the vast majority of our respondents were afraid and felt more susceptible to have COVID-19 infection (83.1% & 89.2%, respectively). This comes in line with Zhou et al. and Maleki et al. [14, 23] who found that 85% and 92% of HCWs, respectively, were afraid of getting infected with the disease and transmitting it to the family. Determining the risk perceived by the HCWs is considered the basic tool to change the attitude and make the workplace more healthy and safe [33, 34].

In our results, the first and the most frequently mentioned items that make HCWs afraid of getting infected is their fear to transmit the infection to their families followed by their belief that the disease is highly transmissible. The stigma associated with infection was mentioned by about two-thirds of the respondents. This was somehow comparable to the findings of Abdelhafiz et al. [16] where about 23% of general population respondents reported stigma associated with the disease. Abdelhafiz et al. explained this stigma by fear of its fatality and high transmissibility. The stigma associated with COVID-19 infection could also be explained by banning of the funeral

prayer in mosques and churches and preventing funeral ceremonies. Although it may sound not important, it has significance, since it may lead to the reluctance of the public to seek medical care and underreporting of cases, which may cause the rapid spread of the disease. Stigma can be combated through proper education, clear announcing of healthcare policies, and launching stigma reduction programs in Egyptian hospitals [16, 35].

In this study, lack of the PPE was the most commonly mentioned cause for feeling more susceptible followed by dealing with the public who are not committed to preventive measures together with ill ventilation and overcrowdedness in the workplace. Likewise [21, 23, 36] reported limited supplies of infection control materials and overcrowding in the emergency rooms were perceived as barriers in infection control practice that could set them at high risk of getting infected.

Even though the Egyptian population had a positive general attitude towards the disease preventive measures, as about three-quarters of respondents believed that the face mask can protect against infection, just about 35% were ready to wear it [16]. This could explain our findings that more than three-quarters of our HCWs feel more prone to infection due to dealing with the public who are not committed to preventive measures. About two-thirds of our HCWs thought they were more susceptible as COVID-19 is a newly emerging disease and several reasons made them more afraid of being infected as; unavailability of specific treatment or vaccine, associated fatalities, and the perceived unsatisfactory response of health authorities. This was corresponding to the reasons outlined to increase the risk perception among emergency nurses [37].

Conclusion and Recommendations

HCWs are the frontline defense in our war against COVID-19. Despite the high knowledge score and the positive attitudes observed in this study, the number of infected and deceased Egyptian doctors and allied health workers was high when compared to the general population as reported by the Egyptian government official reports. So, providing HCWs, especially physicians, with mental, psychological financial and administrative support is crucial. We recommend health education campaigns to the less educated HCWs and the public. Continuous provision of PPE and training of all HCWs on proper infection prevention measures are serious and substantial.

Limitation

Lack of representation of all HCWs in all hospital types in Fayoum Governorate, some HCWs in fever and insurance hospital weren't represented, Using google form to collect part of our sample via internet.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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