

ASSESSMENT OF Physicians & Nurses' ATTITUDE, PRACTICE, AND PERCEIVED BARRIERS TOWARDS COVID-19: A CROSS-SECTIONAL study IN EL BEHEIRA GOVERNORATE, EGYPT

By

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ABSTRACT

Background: Coronaviruses have been a significant hazard and one of the the most cause of human morbidity in recent years. Lack of knowledge and negative attitude toward COVID-19 and its vaccine among healthcare workers (HCWs) could lead to difficulties in controlling the infection with spread of infection among intra-hospitals Physicians and Nurses.

Objective: To assess attitude, practice and perceived barriers to infection control toward COVID-19 among Physicians and Nurses) HCWs (in Kafr El Dawar Central, Dimisna Pediatric Speciality, and Itay El Barud General hospitals in El-Behera governorate during the period from December2022 and May2023.

Methods: A cross-sectional web-based survey was designed using random sampling method and conducted on 1393 HCWs (doctors and nurses) at three hospitals in El-Behera governorate, Egypt. We used Google form sheet and printed questionnaires to collect answers of HCWs to each of the questionnaire items, then data were tabulated and statistically analyzed.

Results: The study included 39.9% physicians, 60.1% nurses. They reported positive attitudes towards the importance of workplace notification (1309; 94%) and continuous involvement in fighting COVID-19 epidemic within the community (1295; 93%) while they reported negative attitudes towards being more active than usual (168; 12.1%) and feeling tired or less energetic during outbreak (239; 17.2%). They reported good practices regarding covering mouth when cough/sneeze (1333; 95.7%) and hand washing after touching contaminated objects (1300; 93.3%) while they reported poor practices towards staying at home to avoid infection (257; 18.4%) and avoid meeting more than 10 persons (367; 26.3%). Barriers to overcome COVID-19 disease mainly included lack of personal protective equipment (PPE) and infection control supplies (905; 65%) and lack of information about the disease (847; 60.8%) while the least reported barriers were lack of workplace operational manual (571; 41%) and lack of training and supervision on operational manual of COVID-19 disease (520; 37.3%). No significant differences ($P>0.05$) were found between the overall mean attitudes, practices, and barriers scores and different characteristics of most participants.

Conclusions: Physicians and Nurses showed fair (57.4%) to positive (37%) attitude and fair (58%) to good (20.7%) practices towards COVID-19 infection while 26.6% disagreed with barriers. The most cited barriers to overcome the disease were lack of PPE and infection control supplies (65%) and lack of information about the disease (60.8%).

Keywords: Attitudes; Practices; Barriers; COVID-19; Healthcare workers; Egypt.

INTRODUCTION

The severity and rapid transamination of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), a potentially fatal disease, is quickly leading to public health catastrophes worldwide. The origin of SARS-CoV-2 infection was first reported in people in Wuhan City, China in December 2019 (Sharma et al., 2020).

healthcare workers (HCWs) who are Frontline involved in hospitalizing COVID-19 patients are exposed to serious work-related risks including frequent

exposure to infection, psychological disorders, fatigue, occupational stigma, and physical violence (Bhagavathula et al., 2020).

HCWs play an essential role in transmission process. They also play an important role in determining the causes, symptoms, and management of emerging infectious diseases. It is imperative to assess HCWs' attitude and practice concerning COVID-19 to help prevent the spread of infection in hospitals. HCWs have become the main source for viral infection since they are in close touch with

affected persons (**Gan et al., 2020**).

Some studies have announced that 69% of hospital based HCWs had an adequate understanding of the illness (Olum et al., 2020). Another study in Pakistan declared that good practice by 89% and higher knowledge levels by 93% among HCW concerning COVID-19 (**Saqlain et al., 2020**).

A WHO report presented that nearly all coronavirus deaths in the united state are people who were not vaccinated, a staggering demonstration of how effective the shot has been (**Carla and Johnson, 2021**). Following the announcement of the first emergency use authorization for COVID-19 vaccine in December 2020 by the Food and Drug Administration, priority to get the vaccine was given for risky groups of populations such as HCWs and medical students. While immunization has effectively decreased the severity and mortality of infectious disease worldwide, a far-reaching trust of vaccines among general populations can be impaired by different factors contributing to the low uptake of the vaccine (**Mbaeyi, 2020**).

This study is predictable significant in classifying the gaps in HCWs' attitude and practices

towards COVID-19 and determines worries in controlling the infection. The findings can serve as a basis for and planning effective strategies for behavioral change and achieve high quality of service and a harmless environment.

SUBJECTS AND METHODS

Study design and sampling:

This is an analytical cross-sectional web-based survey using random sampling method that was done on Physicians and Nurses in El-Behera governorate during the period from December2022 and May2023

Study setting:

Three hospitals in El Beheira governorate were randomly selected including Kafr El Dawar Central hospital, Dimisna Pediatric Speciality hospital, and Itay El Barud General hospital.

Ethical considerations:

1. Approval of Local Ethical Committee at Ministry of Health, Egypt under number (10-2023/12).
2. An electronic informed consent document from anonymous participants was added as an initial cover page

before completing the online survey..

3. Emphasis on voluntary participation, and the right to withdraw without giving a justification.
4. All the obtained data are confidential, and the participants have the right to keep them.
5. The authors declare that there is no financial support regarding the research and publication.
6. No conflict of interest regarding the study and publication.

Sample size:

The total number of HCWs in the three selected hospitals was 1715 (based on the statistical office in each hospital). They were all invited to participate by filling the Google form or the printed questionnaire. The correct responses were 1393 representing 81.2% response rate.

Inclusion criteria:

All HCWs in the selected hospitals were targeted regardless age, gender, or occupation who agreed to take part in the survey. They were divided into 3 categories including A) physicians, B) nurses .

Exclusion criteria:

Non HCWs within the selected hospitals, those who refused to participate, and HCWs from other hospitals or primary healthcare centers within the governorate or from other governorates.

Survey development:

There was a pilot trial that done on 45 contributors, 15 from each hospital (excluded from the final analysis) to test the validity of the questionnaire and to identify any required modifications, and it was finalized after a series of group discussions with an estimated completion time of about 15 minutes.

The questionnaire was uploaded via the Google online platform and distributed through different online communication methods by the heads of each department to all HCWs within the hospitals. In addition, personal communications helped rapid distribution of the survey. Participants were able to see the survey and answer the questionnaire by just clicking the relevant link. For HCWs who could not use the Google forms, questionnaires were also printed and distributed by data collectors.

Questionnaire and scoring system

The questionnaire included:

- Socio-demographic characteristics of participants,

- history of chronic diseases, years of experience, and receiving training courses or workshops about COVID-19 (site and numbers).
- History of PCR-confirmed COVID-19 infection, vaccination history (type and doses), timing of infection in relation to vaccine received, and workplace notification in case of infection.
 - Attitude towards COVID-19 infection was assessed using 14 items (some items were negatively stated) that were divided into two groups. The first group contains 6 items that were measured by 5-point Likert scale of agreement (strongly disagree, disagree, uncertain, agree, or strongly agree) (demonstrated at table 2 “items 1–6”). The second group contains 8 items measuring their worry/stress and contains 3 answers (not at all, for some days, almost daily) (demonstrated at table 2 “items 7–14”). Two points were given for positive attitude, one point for uncertain (fair) attitude, and 0 for negative attitude. The total attitude score was 28 (range 0–28) that divided into positive attitude (score 22–28), fair attitude (score 15–21) or negative attitude (score < 14).
 - Practices towards COVID-19 infection was assessed using 13 items measured based on 5 options (never, to some extent, sometimes, usually, or always) (demonstrated at table 3). Two points were given for good practice, one point for sometimes (fair) practice, and 0 for poor practice. The total practice score was 26 (range 0–26) that divided into good practice (score 21–26), fair practice (score 14–20) or poor practice (score < 13). Both attitude and practice scores were graded as good/positive (based on > 75% of the summed scores), fair (51–75%) or poor/negative (if < 50%).
 - Barriers to overcome COVID-19 disease was assessed using 10 items measured based on 5-point Likert scale of agreement (strongly disagree, disagree, uncertain, agree, or strongly agree) (demonstrated at table 4). Three points were given for disagreement with barriers, two points for uncertain (undecided), and one point for agreement with barriers. The total barriers score was 30 (range 0–30) that divided into agree with barriers (score < 10), undecided (score 11–20) or disagree with barriers (score 21–30).

- To overcome the possibility of weak responses from participants, we tried using a cover letter, plain design, clear instructions, follow-up reminders, and easy-to-read formats.

Statistical analysis:

It was carried out using the SPSS package (IBM, V 25.0, Armonk, NY: IBM Corp., USA). The data were transferred from an excel spreadsheet to SPSS and then processed, analyzed, and

shown in detailed tables. Mean \pm SD were used for quantitative variables, while frequency and percentage measures were used for qualitative variables. Chi-square or Fisher exact tests were used to assess any differences in frequencies of qualitative variables while independent samples t- or One-Way ANOVA tests were used for the continuous variables. Statistical methods were verified, assuming a significance level of $p < 0.05$ (two-tailed).

RESULTS**Table (1): General Characteristics of the Study Participants Stratified by Vaccination Status**

Variables		Total n=1393 (%)	Vaccinated group n=1205 (%)	Non- vaccinated group n =188 (%)	P- value
Age	20 – 30 years	742 (53.3)	639 (53.0)	103 (54.8)	0.854
	31 – 40 years	480 (34.5)	417 (34.6)	63 (33.5)	
	41 – 50 years	142 (10.2)	125 (10.4)	17 (9.0)	
	51 – 60 years	29 (2.1)	24 (2.0)	5 (2.7)	
Gender	Male	471 (33.8)	418 (34.7)	53 (28.2)	0.082
	Female	922 (66.2)	787 (65.3)	135 (71.8)	
Residence	Rural	541 (38.8)	478 (39.7)	63 (33.5)	0.211
	Urban	648 (46.5)	556 (46.1)	92 (48.9)	
	Semi-urban	204 (14.6)	171 (14.2)	33 (17.6)	
Social status	Single	284 (20.4)	251 (20.8)	33 (17.6)	0.579
	Married	1075 (77.2)	925 (76.8)	150 (79.8)	
	Unmarried ¹	34 (2.4)	29 (2.4)	5 (2.7)	
Having children (Yes)		984 (70.6)	849 (70.5)	135 (71.8)	0.731
Hospital	Kafr El Dawar	265 (19.0)	238 (19.8)	27 (14.4)	0.215
	Itay El Barud	577 (41.4)	495 (41.1)	82 (43.6)	
	Dimisna Pediatric	551 (39.6)	472 (39.2)	79 (42.0)	
Occupation	Physician ²	556 (39.9)	469 (38.9)	87 (46.3)	0.160
	Nurse ³	837 (60.1)	736 (61.1)	101 (53.7)	
Having chronic disease (Yes)		170 (12.2)	150 (12.4)	20 (10.6)	0.550
No. of chronic diseases	One	126 (74.1)	109 (72.7)	17 (85.0)	0.449
	Two	35 (20.6)	33 (22.0)	2 (10.0)	
	Three or more	9 (5.3)	8 (5.3)	1 (5.0)	
Years of experience	1 – 4 years	484 (34.7)	419 (34.8)	73 (38.8)	0.457
	5 – 10 years	458 (32.9)	399 (33.1)	59 (31.4)	
	11 – 15 years	229 (16.4)	203 (16.8)	26 (13.8)	
	16 – 20 years	119 (8.5)	99 (8.2)	20 (10.6)	
	>= 21 years	95 (6.8)	85 (7.1)	10 (3.5)	
Corona training/workshops (Yes)		612 (43.9)	540 (44.8)	72 (38.3)	0.098

Values present as number and percent were analyzed by Chi-square or Fisher exact tests.

1 Includes divorced (n=24) and widow (n=10).

2 Qualifications include bachelor (n=326), master (n=177), fellowship (n=45), and M.D (n=8).

3 Qualifications include nursing diploma (n=427), bachelor (n=391), master (n=9), fellowship (n=2), and M.D (n=8).

This table shows that, the vaccination status was not affected by any of their socio-demographic characteristics whether age, gender, residence, social status, or having children. Also, presence of chronic illness,

years of experience, and receiving training courses/workshops about COVID-19 did not show significant differences between both groups. ($P>0.05$ in all).

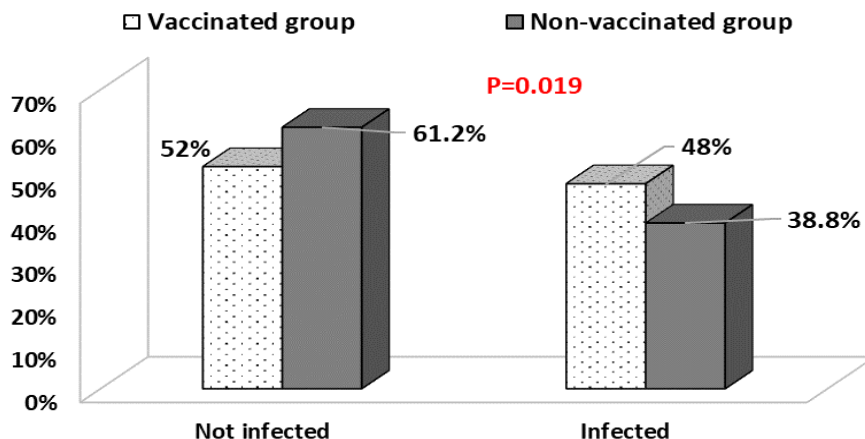


Figure (1): Confirmed COVID-19 infections before vaccine availability stratified by vaccination status

Before availability of vaccines, a total of 652 (46.8%) of all participants reported confirmed COVID-19 infection with a statistically significant

higher percentage of infection among the later vaccinated group ($n=579$; 48%) than the non-vaccinated group ($n=73$; 38.8%) ($P=0.019$).

Table (2): Positive Attitudes of Participants towards COVID-19 Infection Stratified by Vaccination Status

Attitude	Total n=1393 (%)	Vaccinated group n=1205 (%)	Non-vaccinated group n =188 (%)	P- value
COVID-19 could be globally controlled				
	1035 (74.3)	886 (73.5)	149 (79.3)	0.247
Trust that Egypt can overcome COVID-19				
	1024 (73.5)	883 (73.3)	141 (75.0)	0.682
Active participation of HCWs in infection control to overcome infection transmission				
	1180 (84.7)	1011 (83.9)	169 (89.9)	0.066
Commitment to scheduled vaccination				
	1073 (77.0)	956 (76.8)	147 (78.2)	0.916
Workplace notification is important				
	1309 (94.0)	1131 (93.9)	178 (94.7)	0.792
HCWs continuous involvement in fighting COVID-19 epidemic within community till eradicated				
	1295 (93.0)	1119 (92.9)	176 (93.6)	0.141
Still feeling worried and hopeless about COVID-19				
	686 (49.2)	596 (49.5)	90 (47.9)	0.542
Sleep disturbances with increased COVID-19 infection rate				
	399 (28.6)	340 (28.2)	59 (31.4)	0.051
Feeling tired or less energetic during COVID-19 outbreak				
	239 (17.2)	206 (17.1)	33 (17.6)	0.401
Poor appetite or overeating during COVID-19 outbreak				
	463 (33.2)	393 (32.6)	70 (37.2)	0.453
Feeling no confidence in defeating the virus				
	560 (40.2)	478 (39.7)	82 (43.6)	0.245
Hard to focus on things like reading newspaper or watching TV during the outbreak				
	527 (37.8)	453 (37.6)	74 (39.4)	0.735
Better to die or hurt myself than to catch COVID-19 or someone in my family				
	760 (54.6)	666 (55.3)	94 (50.0)	0.064
On the contrary, more active than usual during the COVID-19 outbreak				
	168 (12.1)	137 (11.4)	31 (16.5)	0.121
Overall attitude score (Max.=28)	20.27±3.4	20.25±3.4	20.37±3.2	0.652

Values present as number & percent were analyzed by Chi-square test.

Values present as mean ±SD were analyzed by Independent Samples t-test.

This table shows no significant difference between vaccinated and non-vaccinated groups regarding the attitude

towards COVID-19 infection or in each attitude item ($P>0.05$ whether in their overall attitude in all).

Table (3): Good Practices of Participants towards COVID-19 Infection Stratified by Vaccination Status

Practice	Total n=1393 (%)	Vaccinated group n=1205 (%)	Non-vaccinated group n =188 (%)	P- value
Go to crowded place				
	521 (37.4)	455 (37.8)	66 (35.1)	0.550
Wearing face mask outside home				
	632 (45.4)	539 (44.7)	93 (49.5)	0.444
Wearing PPE when dealing with patient				
	1156 (83.0)	994 (82.5)	162 (86.2)	0.458
Safe disposal of PPE				
	1208 (86.7)	1036 (86.0)	172 (91.5)	0.114
Cover mouth when cough/sneeze				
	1333 (95.7)	1151 (95.5)	182 (96.8)	0.712
Avoid public transportation recently				
	547 (39.3)	476 (39.5)	71 (37.8)	0.899
Immediate hand wash after cough/sneeze				
	1117 (80.2)	963 (79.9)	154 (81.9)	0.330
Always wear face mask				
	745 (53.5)	642 (53.3)	103 (54.8)	0.928
Hand wash after touching contaminated objects				
	1300 (93.3)	1124 (93.3)	176 (93.6)	0.364
Avoid using elevator recently				
	373 (26.8)	311 (25.8)	62 (33.0)	0.116
Avoid eating with others in the same table				
	373 (26.8)	317 (26.3)	56 (29.8)	0.381
Avoid meeting more than 10 persons recently				
	367 (26.3)	309 (25.6)	58 (30.9)	0.172
Stay at home to avoid infection				
	257 (18.4)	217 (18.0)	40 (21.3)	0.229
Overall practice score (Max.=26)	16.86±4.4	16.81±4.4	17.22±4.4	0.234

Values present as number & percent were analyzed by Chi-square test.

Values present as mean ±SD were analyzed by Independent Samples t-test.

This table shows that, the overall mean practice score was 16.86±4.4 (Max.=26) with no significant difference between

the vaccinated and non-vaccinated groups ($P=0.234$) and all practice related items didn't

significantly differ by their vaccination status ($P>0.05$ in all)

Table (4): Agreement on Barriers to Overcome COVID-19 Disease Stratified by Vaccination Status

Barriers	Total n=1393 (%)	Vaccinated group n=1205 (%)	Non-vaccinated group n =188 (%)	P- value
Lack of information about COVID-19 disease				
	847 (60.8)	717 (59.5)	130 (69.1)	0.040*
Inability to wear PPE during examination or contact with the patient				
	810 (58.1)	684 (56.8)	126 (67.0)	0.023*
Lack of PPE and infection control supplies				
	905 (65.0)	771 (64.0)	134 (71.3)	0.148
Inability to wash hands after each examination or contact with the patient				
	772 (55.4)	667 (55.4)	105 (55.9)	0.977
Lack of infection control practice policies and procedures				
	703 (50.5)	591 (49.0)	112 (59.6)	0.026*
Inadequate training on infection control practices				
	764 (54.8)	653 (54.2)	111 (59.0)	0.455
Lack of adherence of HCWs to policies and procedures				
	779 (55.9)	660 (54.8)	119 (63.3)	0.074
Increased number of patients impedes practicing infection control				
	788 (56.6)	677 (56.2)	111 (59.0)	0.758
Lack of workplace operational manual of COVID-19 disease				
	571 (41.0)	481 (39.9)	90 (47.9)	0.084
Lack of workplace training and supervision on operational manual of COVID-19 disease				
	520 (37.3)	438 (36.3)	82 (43.6)	0.074
Overall barrier score (Max.=30)	17.09±5.9	17.24±5.9	16.14±5.7	0.018*

Values present as number & percent were analyzed by Chi-square test.

Values present as mean ±SD were analyzed by Independent Samples t-test.

*: Significant.

The vaccination status didn't affect their level of agreement on barriers to overcome COVID-19 disease except for lack of information about COVID-19 disease, inability to wear PPE during examination or contact

with the patient, and lack of infection control practice policies and procedures that were significantly higher among the non-vaccinated group ($P=0.040$, 0.023 , and 0.026 respectively). However, the overall mean

barrier score was significantly higher among the vaccinated

group (P=0.018).

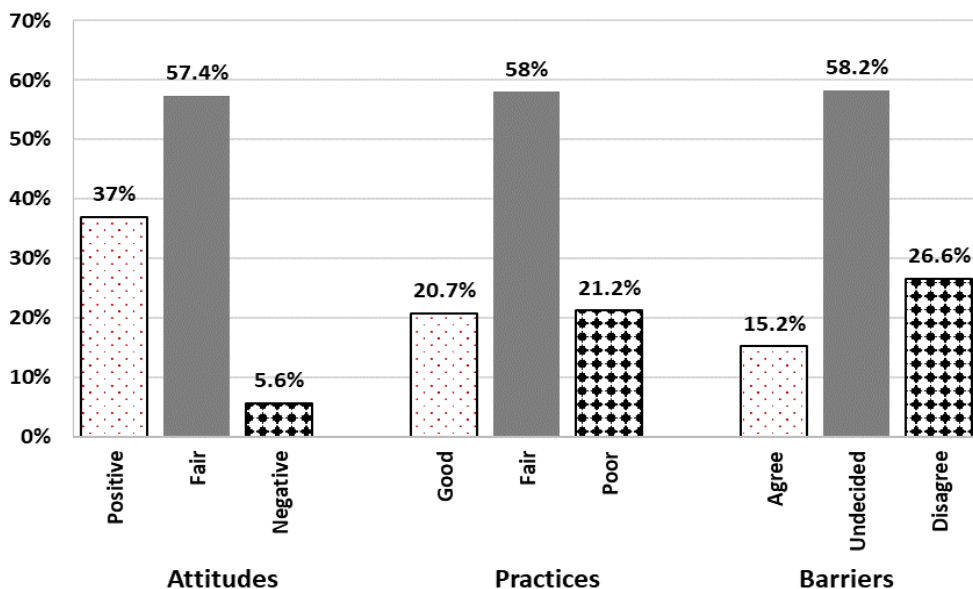


Figure (2): Overall Attitude, Practice, and Barrier Scores towards COVID-19 Infection

Positive attitudes towards COVID-19 infection were reported by 37% of participants while 57.4% had fair attitudes and only 5.6% had negative attitudes. About 20.7% reported good practices, 58% with fair practices, and 21.2% with poor practices. Regarding barriers,

26.6% disagreed with barriers, 58.2% were undecided, and 15.2% considered presence of barriers to overcome COVID-19 disease. No significant differences in attitudes, practices, and barriers were found between both groups (P=0.203, 0.291, and 0.458) respectively.

Table (5): Relation between General Characteristics of Participants and the Mean Attitudes, Practices, and Barriers Scores

Variables		Attitudes score (Max.=28)	Practices score (Max.=26)	Barriers score (Max.=30)
Age	20 – 30 years	20.37±3.3	17.03±4.4	17.06±5.9
	31 – 40 years	20.19±3.6	16.84±4.3	17.21±5.9
	41 – 50 years	19.94±3.3	16.22±4.2	16.77±6.0
	51 – 60 years	20.62±3.1	16.07±5.6	17.48±6.75
Gender	Male	20.21±3.3	17.00±4.2	17.00±5.9
	Female	20.30±3.5	16.80±4.5	17.14±6.0
Hospital	Kafr El Dawar	19.87±3.3	16.56±4.8	17.01±6.0
	Itay El Barud	20.38±3.4	17.05±4.3	17.55±5.9 *
	Dimisna Pediatric	20.33±3.4	16.81±4.3	16.66±5.9
Occupation	Physician	20.12±3.5	16.98±4.4	17.05±5.8
	Nurse	20.31±3.4	16.91±4.4	17.15±6.0
Residence	Rural	20.48±3.4	16.92±4.4	17.10±5.9
	Urban	20.06±3.4	16.96±4.4	17.00±6.0
	Semi-urban	20.37±3.2	16.44±4.4	17.36±5.8
Social status	Single	20.21±3.5	17.02±4.6	16.83±5.9
	Married	20.31±3.4	16.86±4.3	17.07±5.9
	Unmarried	19.38±3.5	15.50±4.8	20.03±6.0 *
Having children	Yes	20.28±3.3	16.73±4.4	17.15±5.9
	No	20.23±3.5	17.17±4.4	16.95±6.0
Having chronic disease	Yes	19.66±3.2	16.36±4.3	16.70±5.7
	No	20.35±3.4 *	16.93±4.4	17.10±6.0
No. of chronic diseases	One	19.60±3.1	16.42±4.3	16.87±5.7
	Two	19.94±3.4	16.43±4.1	15.89±5.3
	Three or more	19.56±3.4	15.22±4.1	17.44±7.3
Years of experience	1 - 4 years	20.25±3.3	17.11±4.4	16.89±5.9
	5 - 10 years	20.45±3.4	16.74±4.4	17.26±6.0
	11 - 15 years	20.17±3.5	17.02±4.1	17.75±5.9
	16 - 20 years	19.97±3.1	16.40±4.3	16.31±5.6
	>= 21 years	20.11±3.7	16.37±4.7	16.72±6.3
Corona training /workshops	Yes	20.22±3.4	16.95±4.3	17.40±5.9
	No	20.31±3.4	16.80±4.4	16.85±5.9
Site for training /workshops	MOH	19.84±3.5	16.88±4.3	17.42±6.0
	Workplace	20.35±3.4	16.94±4.4	17.40±5.9
	University	20.36±3.6	18.36±2.5	17.09±5.4
No. of training /workshops	1 - 2	20.28±3.5	17.03±4.4	17.36±6.1
	3 - 4	20.14±3.1	16.59±4.0	17.62±5.6
	5 or more	19.74±3.1	16.79±4.9	17.33±5.5

Values present as mean \pm SD were analyzed by Independent Samples t- and One-Way ANOVA tests.

*: Significant.

Positive attitudes were noticed among participants with older ages (51-60 years), among female, those working in Itay El Barud hospital, those living in rural areas, those who are married and having children, those with 5-10 years of experience, and those who did not receive training courses. However, this difference was non-significant except for positive attitudes among those with no chronic diseases ($P=0.013$). Good practices were higher among participants with younger ages (20-30 years), among male, those working in Itay El Barud hospital, among physicians, those living in urban areas, those who are single, those

with no chronic diseases, those with 1-4 years of experience, and those who received training courses. However, this difference was non-significant ($P>0.05$ in all). Agreement on barriers were noticed among participants with older ages (51-60 years), among female, those working in Itay El Barud hospital, among nurses, those living in semi-rural areas, those who are unmarried, those with no chronic diseases, those with 11-15 years of experience, and those who received training courses. However, this difference was non-significant except for those working in Itay El Barud hospital ($P=0.040$) and among the unmarried ($P=0.011$).

Table (6): Relation of Corona Training/Workshops with Different Study Variables Stratified by Vaccination Status

Variables		Total n=612 (%)	Vaccinated group n=540 (%)	Non- vaccinated group n =72 (%)	P- value
Site for training / workshops	MOH	155 (25.3)	137 (25.4)	18 (25.0)	0.958
	Workplace	446 (72.9)	393 (72.8)	53 (73.6)	
	University	11 (1.8)	10 (1.9)	1 (1.4)	
No. of training / workshops	1 - 2	474 (77.5)	414 (76.7)	60 (83.3)	0.441
	3 - 4	95 (15.5)	87 (16.1)	8 (11.1)	
	5 or more	43 (7.0)	39 (7.2)	4 (5.6)	
Trainees	Physician	207 (33.8)	176 (32.6)	31 (43.1)	0.116
	Nurse	405 (66.2)	364 (67.4)	41 (56.9)	
Hospital	Kafr El Dawar	150 (24.5)	137 (25.4)	13 (18.1)	0.122
	Itay El Barud	256 (41.8)	218 (40.4)	38 (52.8)	
	Dimisna Pediatric	206 (33.7)	185 (34.3)	21 (29.1)	
Overall attitudes score		20.35±3.37	20.31±3.37	20.63±3.40	0.464
Overall practices score		16.63±4.31	16.63±4.36	16.62±3.91	0.988
Overall barriers score		17.32±6.00	17.39±5.97	16.83±6.16	0.462

Values present as number and percent were analyzed by Chi-square test.

Values present as mean ± SD were analyzed by Independent Samples t-test.

Among participants who received corona training/workshops (n=612), no significant differences were found between the vaccinated and non-vaccinated groups regarding site or number of training/workshops, nature of

their work whether physicians, nurses, or which hospital they are working in. Also, their overall attitudes, practices, or barriers scores did not show significant differences between both groups (P>0.05 in all).

DISCUSSION

Exposure of HCWs to suspected or confirmed cases of human coronavirus puts them at a high risk of infection, other associated problems, and even

deaths (Zhang et al., 2018). Sufficient knowledge about the disease may positively affect their attitudes and practices which have a major impact in reducing further spread of the disease (Gan et al.,

2020). Hence, this study aimed to assess attitude, practice, and perceived barriers to infection control toward COVID-19 among HCWs in El Beheira governorate, Egypt.

Most of Physicians and Nurses were vaccinated (1205; 86.5%) however, the rate of infection before vaccine availability was significantly higher among the group that later received the vaccines (Figure 1). High vaccine acceptance is notable considering the potential risks linked to HCWs due to the close contact with high-risk patients. Therefore, vaccination of Physicians and Nurses is essential to prevent healthcare-associated COVID-19 infections. This high rate of vaccine acceptance was comparable to the findings of other studies conducted on different HCWs (Tharwat et al., 2022; Youssef et al., 2022). The vaccination status of our participants was not affected by any of their socio-demographic characteristics, presence of chronic illness, years of experience, or receiving training courses/workshops about COVID-19 (Table 1). In contrary to this finding, Medhat et al., 2022 and Wang et al., 2020 confirmed the impact of socio-demographic characteristics on COVID-19 vaccination acceptance.

Physicians and Nurses showed fair (57.4%) to positive (37%) attitude towards COVID-19 infection. Similar findings of good attitude were reported by Saqlin et al., 2020. Their positive attitudes were obvious regarding the importance of workplace notification (94%) and HCWs continuous involvement in fighting COVID-19 epidemic within community (93%). The same finding was reported by Bashir et al., 2021. On the other hand, they reported negative attitudes towards being more active than usual (34.4%) and feeling tired or less energetic (20.5%) during COVID-19 outbreak with no significant difference between vaccinated and nonvaccinated groups (Table 2). In the study of Galal et al., 2021 the overall positive attitude of HCWs toward COVID-19 was detected in 64% of respondents. About 55% mentioned that they were afraid of being infected with COVID-19 at work. However, Maleki et al., 2020 reported that 89.2% of HCWs were afraid and felt at risk of getting infected with coronavirus.

Tolossa et al., 2022 found that 51.28% of health professionals had a favorable attitude towards COVID-19 vaccination particularly those having good knowledge about the vaccine. In a

systematic review done by **Hajure et al., 2021** on attitude towards COVID-19 vaccination among HCWs, they found in about two-thirds of the studies, respondents showed a positive attitude ($\geq 50\%$) toward COVID-19 vaccination. Factors affecting their attitudes include age, sex, profession, concerns about the vaccine safety and fear of COVID-19, trust in governmental measures, flu vaccination during the previous season, comorbid chronic illness, history of recommendation, and depression symptoms in the past week.

Regarding the practices, Physicians and Nurses showed fair (58%) to good (20.7%) practices towards COVID-19 infection. The most reported good practices included covering mouth when cough/sneeze (95.7%) and hand washing after touching contaminated objects (93.3%) (**Table 3**). This finding is largely consistent with **Galal et al., 2021** who found that almost all contributors (99%) correctly identified the ideal way for hand washing, social distancing, and using face masks as the main preventive measures for reducing transmission of COVID-19. Also, adequate knowledge regarding the preventive measures of the disease was detected in an Indian study by **Roy et al., 2020**. However,

Kumar et al., 2020 reported a moderate to poor level of knowledge related to using face masks for prevention COVID-19. In the study of **Bashir et al., 2021**, only 53.96% reported wearing a face mask outside their homes, indicating that HCWs' attitudes towards face masks are moderate to poor. So, efforts should be done to increase HCWs' awareness of the importance of face masks in infection prevention.

Regarding the barriers, 26.6% disagreed, 58.2% were undecided, and 15.2% considered presence of barriers to overcome COVID-19 disease. The most cited barriers were lack of PPE and infection control supplies (65%) and lack of information about the disease (60.8%) whereas, the least reported barriers were lack of workplace operational manual (41%) and lack of workplace training and supervision (37.3%) (**Table 4**). In the study of **Galal et al., 2021** the most frequently mentioned barriers for applying infection control measures in hospitals were overcrowdings in health-care facilities (78.2%), inadequate infection control policies and actions (62.6%), lack of necessary information about the disease among Physicians and Nurses (56.4%), and deficient infection control supplies (53.6%). Similar finding reported by **Saqlin**

et al., 2020 who found that overcrowding in emergency rooms was perceived by the majority of HCWs as a barrier to infection control, however, 31.6% and 36.7% of HCWs in that study thought that not wearing a mask and not doing hand washing were not barriers to infection control.

Generally, no significant differences were found between the overall attitudes, practices, and barriers scores and different characteristics of participants (Table 5) which is inconsistent with the findings reported by Galal et al., 2021 where nurses had an overall significantly higher practice score than doctors ($p < 0.001$) and a significantly higher percent of nurses than doctors stated that they can correctly put on and take off PPE (78% vs. 68%, $p = 0.049$). Saqlin et al., 2020 revealed in their study that pharmacists (94.7%, $N=179$) had greater knowledge than doctors (93.3%, $N=112$) and nurses (90.5%, $N=95$), but the difference was not significant ($p=0.383$).

CONCLUSIONS

Physicians and Nurses showed fair (57.4%) to positive (37%) attitude and fair (58%) to good (20.7%) practices towards COVID-19 infection while 26.6% disagreed with barriers. The most cited barriers to overcome the disease

were lack of PPE and infection control supplies (65%) and lack of information about the disease (60.8%). No significant differences were found between the overall mean attitudes, practices, and barriers scores and different characteristics of most participants ($P>0.05$).

RECOMMENDATION

To make these groups who didn't receive any vaccines or not complete three doses, aware and provide a safer workplace, health awareness campaigns emphasizing the advantages of vaccination through behavior change communication are required. To defeat the COVID-19 infection, more training programmers on preventative measures are required, as well as programmers to enhance attitudes among Physicians and Nurses.

STUDY LIMITATIONS

It is important to interpret the results in the context of potential study limitations that may affect generalization of the results. First, as a cross-sectional study, it is difficult to ensure cause-effect relationship. Second, the use of web-based survey can lead to selection bias with inaccurate estimation of the current situation and limited participation of individuals who are less likely to use technology. Third, self-

reported data may not be entirely accurate due to recall bias and social desirability bias so, it should be viewed with caution. Fourth, HCWs at the private sector were not included. Fifth, vaccination status and acceptance and compliance with protective measures may change with subsequent epidemic waves or when data about certain vaccines change over time. Sixth, workplace exposure to COVID-19 cases may have exacerbated their levels of worry and stress, and we did not control of this potential variable. Seventh, we were unable to monitor their practices and commitment to infection preventive measures over time. Eighth, unmeasured covariates may lead to residual confounding effects. In addition, findings may vary in other populations with different ethnic, cultural, and geographical backgrounds.

Acknowledgements:

We thank all the participants in the study.

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doi: 10.1371/journal.pone.0264128.