



Utilization of Coronavirus 2019 (COVID-19) Vaccination among Healthcare Workers in Minia Governorate, Egypt

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ABSTRACT

Background: Healthcare workers (HCWs) are at high risk of getting COVID-19 from their patients. Yet not all HCWs get the required vaccination. **Objective:** to determine the rate of vaccination among HCWs and to identify the factors affecting the vaccination utilization. **Method:** A cross-sectional study was conducted in El-Edwa Central Hospital from January 2022 to April 2022 on HCWs (124 males and 176 females) using a validated as well as structured self-administered survey including elements to assess the utilization of COVID-19 vaccines among HCWs. **Results:** A total 300 HCWs were included in the current analysis. The mean age was 34.7±9.7 years and 59% were females. Approximately 264 participants (88%) received the initial dose of the COVID-19 vaccine, and approximately 91% of the vaccinated participants completed the immunization course. AstraZeneca and Sinovac vaccines were the most taken among HCWs (23% and 21%, respectively). Reports of widespread weakness or fatigue were the most common generalized symptoms. Independent predictors of lack of vaccination included worrying about vaccine safety (OR=7.50, 95% CI. 2.67-21.07; p<0.0001) and disagreement regarding the vaccine's ability to give full protection against COVID-19 infection (OR= 4.99, 95% CI 1.866-.13.343; p=0.001). **Conclusions:** In general, there was a high rate of COVID-19 vaccination among HCWs at El-Edwa Central Hospital. Considering the vaccine is unsafe and doesn't give full protection against COVID-19 infection were the predictors of lack of vaccination among the study group. The findings underscore the importance of increasing awareness of HCWs.

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INTRODUCTION

Massive mortality and morbidity have been caused worldwide by the development and dissemination of SARS-CoV-2. Worldwide, approximately 645 million cases of COVID-19 have been confirmed as of December 2022, with over 6.6 million deaths attributable to the virus. Estimates put the number of confirmed cases of COVID-19 in Egypt at more than

500,000, with over 24,000 fatalities attributable to the virus.¹ Furthermore, the COVID-19 pandemic remains a persistent concern to public health since breakthrough infections and novel, highly transmissible strains of SARS-CoV-2 continue to impact even those who are fully vaccinated.²

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To stop the spread of COVID-19, a large enough percentage of the world's population must be given herd immunity. On the other hand, the novel strain of the disease could put an even greater demand on the limited healthcare resources, making it counterproductive to achieve herd immunity through natural infection as well as recovery followed by immunity development.³

While the worldwide acceleration of COVID-19 vaccine research has been promoted as an excellent accomplishment, it has also prompted more public and healthcare providers to doubt the vaccine's efficacy. The WHO's Strategic Advisory Group of Experts on Immunization defines "Vaccine Hesitancy" as a public behavioral response that includes factors such as people's distrust of vaccines and vaccine manufacturers, inadequate understanding of vaccines' efficacy in preventing numerous fatal diseases prior to COVID-19, and problems with vaccine accessibility⁴. HCWs face a higher likelihood of becoming infected and yet have a crucial responsibility in delivering healthcare services to the country. HCWs significantly impact the rate at which their patients receive vaccines. The aim of the study is to assess the rate of vaccination among HCWs and to identify the factors affecting the vaccination utilization.

METHODS

The study was a hospital-based, cross-sectional study performed among HCWs in El-Edwa Central Hospital from January 2022 to April 2022 after obtaining permission from the administrator of El-Edwa Central Hospital.

Participants of the study were HCWs in El-Edwa central hospitals. These included medical professionals (consultant/specialist, general practitioner, and medical resident), nurses, physical therapy, pharmacy staff, laboratory staff, and other HCWs. The later included paramedics, radiology technicians, and security workers, asked the hospital staff included in the study to respond to a questionnaire that would be specially developed.

Sample size: El-Edwa Central Hospital was selected randomly (simple random sample) from the nine Minia districts. The estimated population of all medical and paramedical personnel was 450. The necessary sample size was determined using the statistical software EPI-INFO 7.2.5.0. It was assumed

Table 1: Utilization of COVID-19 vaccination among HCWs (n=300), El-Edwa Central Hospital, Minia governorate, from January 2022 to April 2022

	N	%
Being vaccinated with COVID-19 Vaccine	264	88
Time of COVID-19 vaccine first dose taken (from start of the study)		
Within 1 month	34	12.9
1-3 months	79	29.9
3-6 months	74	28
> 6 months	77	29.2
Total	264	100
Second dose of COVID-19 vaccine	239	90.5
Got or plan to take third dose COVID-19 vaccine	58	22
Cause of third dose COVID-19 vaccine refusal		
Useless	41	20
Fear of side effects	53	25.7
Don't know	112	54.3
Total	206	100

that the greatest variability would be 50%, with a confidence interval of 97% with a margin of error of 5%. Based on these assumptions, a minimum sample size of 280 was obtained. We randomly (using computerized method from hospital database) selected 300 people from the whole hospital staff.

Data collection: A validated and structured self-administered questionnaire covering aspects of COVID-19 vaccine utilization among HCWs. A well-designed, self-administered Arabic questionnaire was utilized after a questionnaire was developed in Google Forms and translated into the local language.

The questionnaire consisted of two sections. The first was demographic details of study participants include age, gender, residence, occupation, being infected with COVID-19, and suffering from any chronic disease. The second section was vaccine utilization statements as getting vaccinated or not, when the vaccine was taken, type of vaccine has been taken in the first dose (in case of vaccination), the planning to take the second and third dose, Side effects of taking the vaccine, local symptoms and general symptoms.

Data management: All data was analysed using the Statistical Package for the Social Sciences (SPSS) version 20. A 95% confidence interval was used to interpret the data.

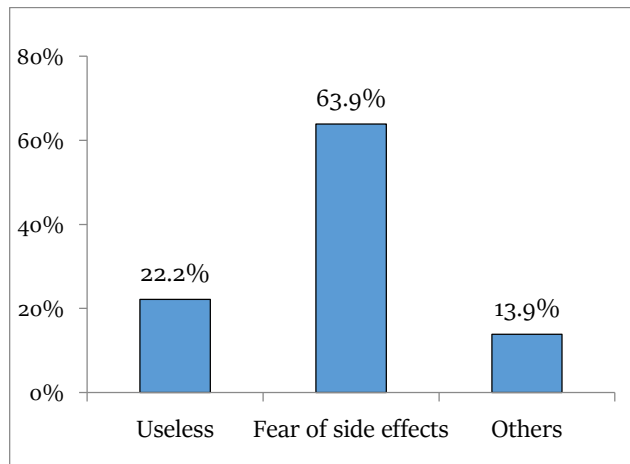


Figure 1: Causes of vaccine refusal among healthcare workers (n=36), El-Edwa Central Hospital, Minia governorate, from January 2022 to April 2022

Using numbers and percentages, descriptive statistics were used to summarise the sociodemographic data and vaccination utilisation statements. The association and comparison among groups for qualitative data were analysed using the Chi-square test as well as Fisher's exact test. The student's t-test was employed to analyse the quantitative data. A p-value greater than 0.05 was deemed to be statistically significant.

RESULTS

Regarding the sociodemographic data of study participants, with ages ranging from 21 to 59 years, the mean age was 34.7±9.7; nearly 41% were males and 59% were females. More than half of HCWs resided in urban areas. Regarding marital status, 73.3% were married and 24% were single. The majority were non-smokers, 86.3%, 0.7% ex smokers and 13% were current smokers. Regarding qualifications, the majority were graduates and postgraduates (about 70%). Regarding comorbidity, most HCWs had no comorbidity (84%).

Vaccine utilization statements are shown in Table 1; 264 study subjects (88%) got the COVID-19 vaccination first dose, while 36 study subjects (12%) did not. Approximately 91% of the research participants who received the COVID-19 vaccine completed the required second dosage. Two hundred and six (88%) planned not to receive the third dosage of COVID-19 vaccine. Forty-one individuals (20%) declined to receive the COVID-19 vaccine as they deemed it ineffective. Furthermore, 53 study subjects

(25.7%) declined to receive the COVID-19 vaccine out

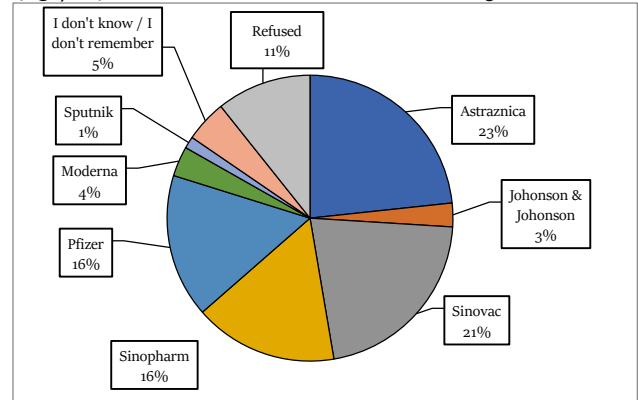


Figure 2: Type of first dose COVID-19 vaccination among healthcare workers (n= 264), El-Edwa Central Hospital, Minia governorate, from January 2022 to April 2022

of concern for its adverse effects. About 54% did not know the definite cause of COVID-19 vaccine refusal. Over 50% of the research participants chose to get the COVID-19 vaccine (61%). Over 50% of the trial participants recommended that others receive the COVID-19 vaccine (53.3%). One hundred (37.9%) of study participants experienced a sense of comfort and security when receiving the initial dose of the COVID-19 vaccination.

The main cause of being non-vaccinated among HCWs was fear of side effects. Nearly 64 % of non-vaccinated study participants refused vaccination because of concerns regarding possible adverse effects, 22 % of non-vaccinated trial participants thought that COVID-19 vaccination is useless and 13.9 % of non-vaccinated study participants refused vaccination due to other causes (Figure 1). As shown in Figure 2, AstraZeneca and Sinovac vaccines were the most taken among HCWs (23%, 21%, respectively). Moderna vaccine and Sputnik vaccine were the vaccines that were taken the least. (3.3 %, 1.3%, respectively). Sinopharm vaccine and Pfizer biontech vaccine were taken among vaccinated HCWs, with the same percentage (16%). Approximately 5% of the trial participants who received the COVID-19 vaccine were unaware of the specific sort of initial dose they received.

Table 2 revealed that injection site pain was experienced by 23.5% of HCWs (62 out of 264), with over 50.3% of HCWs reporting pain in their arms as the most common localised adverse effect. Most patients observed Generalized weakness or exhaustion (28.8%, 76/194), followed by flu-like symptoms affecting the bones and muscles (23.5%).

Table 2: adverse effects of COVID-19 vaccines among HCWs (n=264), El-Edwa Central Hospital, Minia governorate, from January 2022 to April 2022

	N	%
Most annoying local symptoms of COVID-19 vaccine		
No adverse effects appeared	48	18.1
Arm pain	133	50.4
Pain at the site of injection	62	23.5
Injection site redness and swelling	16	6.1
Pain and swollen lymph nodes	5	1.9
Most annoying general symptoms of COVID-19 vaccine		
No adverse effects appeared	70	26.5
Fatigue	76	28.8
Flu-like	41	15.5
Bone and muscle	62	23.5
Hypersensitivity	10	3.8
Clotting symptoms	5	1.9
Timing of adverse effects caused by COVID-19 vaccine		
No adverse effects appeared	34	12.9
After the initial dose of vaccine	142	53.8
After the second dose of vaccine	34	12.9
After both doses	54	20.5
COVID-19 vaccination side effects duration		
No symptoms appeared	34	12.9
Less than 1 day	65	24.6
(1-3) days	124	47
(4-7) days	41	15.5

The initial dose of the COVID-19 vaccine caused adverse effects in more than half of study participants (53.8%). One hundred twenty-four study participants (47%) had side effects of COVID-19 vaccination within (1-3) days.

Table 3 shows the comparison between vaccinated and non-vaccinated healthcare workers. Age has no significant influence on whether to be vaccinated against COVID-19. Moreover, 77.8% of non-vaccinated trial participants were females, while 22.2% of non-vaccinated study participants were males and this difference is statistically significant ($P=.013$). About 72.3% of vaccinated trial participants were graduates or postgraduates and 27.7% were with secondary level qualification and there was a statistically substantial

difference ($P=.039$). The vaccination rate among physicians was higher than other HCWs (43.9% compared to 33.7%, 14.8%, 7.6% among nurses, technicians and clerks, respectively).

Table 4 shows local and general side effects by the type of vaccine. About 50% of HCWs vaccinated with the AstraZeneca vaccine had arm pain as the most prevalent local adverse effects. Moreover, 50% of HCWs vaccinated with the Johnson & Johnson (J&J) vaccine had arm pain as the most prevalent local adverse effects. Nearly 46% of HCWs vaccinated with the Sinovac vaccine had arm pain as the most pervasive local adverse effects. About 58% of HCWs vaccinated with the Pfizer biontech vaccine had arm pain as the most prevalent local adverse effects. However, 50% of HCWs vaccinated with Moderna vaccine had injection site pain as the most prevalent local adverse effects. There was no significant statistical difference between vaccine types to cause a specific local side effect. Fatigue was the commonest general side effect among vaccinated HCWs with Sinovac, Pfizer biontech, and Sinopharm (34.9%, 31.2%, 29.2%), respectively. Bone/muscle pain was the commonest general side effect among vaccinated HCWs with the J&J vaccine and AstraZeneca vaccine (37.5%, 33.3%). There was a significant statistical difference between different vaccines to cause Flu-like symptoms ($p < 0.047$) and hypersensitivity ($p < 0.004$).

Table 5 revealed that the significant independent predictors of lack of vaccination included worrying about vaccine safety (OR=7.50, 95% CI. 2.67-21.07; $p<0.0001$) and disagreement regarding the vaccine's ability to give full protection against COVID-19 infection (OR= 4.99, 95% CI 1.866-.13.343; $p=0.001$).

DISCUSSION

Infection with SARS-CoV is more likely to occur in healthcare workers as well as their families. COVID-19 vaccination of HCWs is critical, as there is no curative treatment for this viral infection until now. There were reports of varying degrees of acceptance of the COVID-19 vaccine.⁵ There is a high level of acceptance towards the COVID-19 vaccine, as 88% of the enrolled HCWs received the vaccine in this trial.

In the current study, the mean age of study participants was 34.7 ± 9.7 years. Most participants were females (58.7%), married (73.7%).

Table 3: Comparison between vaccinated and non-vaccinated healthcare workers regarding sociodemographic characteristics (N=300), EL-Edwa central hospital, Minia governorate, from January 2022 to April 2022

Categories	Non-vaccinated (N=36)	Vaccinated (N=264)	Total	p-value
Age				
Mean±SD	35.5±10.7	34.6±9.6		0.628
Gender				
Male	8 (22.2)	116 (43.9)	124 (41.3)	0.013*
Female	28 (77.8)	148 (56.1)	176 (58.7)	
Residence				
Urban	23 (63.9)	153 (58)	176 (58.7)	0.498
Rural	13 (36.1)	111 (42)	124 (41.3)	
Occupation				
Physician	18 (50)	116 (43.9)	134 (44.74)	0.448
Nurse	14 (38.9)	89 (33.7)	103 (34.3)	
Technician	2 (5.6)	39 (14.8)	41 (13.7)	
Clerk	2 (5.6)	20 (7.6)	22 (7.3)	
Marital status				
Single	8 (22.2)	64 (24.2)	72 (24)	0.777
Married	28 (77.8)	193 (73.1)	221 (73.7)	
Divorced	0 (0)	3 (1.1)	3 (1)	
Widowed	0 (0)	4 (1.5)	4 (1.3)	
Education				
Graduate/Post graduate	20 (55.6)	191 (72.3)	211 (70.3)	0.039*
Secondary	16 (44.4)	73 (27.7)	89 (29.7)	
Smoking				
Yes	3 (8.3)	36 (13.6)	39 (13)	0.579
No	33 (91.7)	226 (85.6)	259 (86.3)	
Ex-smoker	0 (0)	2 (.8)	2 (0.7)	

Slightly similar results were found conducted by El-Sokkary et al. (2021) among Egyptian HCWs; the mean age of study⁶ participants was 37.6 ± 10.1 . There were primarily female participants (77.6%), married (80.8%). In the current study, a significant proportion of the participants were urban residents, accounting for 58.7% of the El-Ghitany et al. (2022), and the majority were urban residents (69.5%).⁷ As regards smoking status, the majority of study participants were non-smokers (86.3%). This was slightly in line with the results of a study carried out by Baghdadi et al. (2021) in Saudi Arabia among HCWs (85.6%) who were non-smokers.⁸

Additionally, according to the present study, 88% of HCWs were vaccinated against COVID-19, which agreed with previous research showing acceptance rates as high as 70–90%.⁹⁻¹² Canada also had a greater percentage of COVID-19 vaccination uptake, considering that just 19.1% declined the vaccine, 80.9% received it.¹³ Vaccine uptake was shown to be lower in another study conducted in Egypt¹⁴. Upon analysis, it was shown that 21% of HCWs expressed a willingness to receive the COVID-19 vaccination, while 28% expressed a lack of willingness. However, the largest proportion of participants remained unsure (51%).

Table 4: Local and general side effects by vaccine type among vaccinated healthcare workers (N=264), EL-Edwa central hospital, Minia governorate, January 2022 to April 2022

	Oxford (N=56) N (%)	J & J (N=6) N (%)	Sinovac (N=51) N (%)	Sinopharm (N=36) N (%)	Pfizer (N=41) N (%)	Moderna (N=10) N (%)	Sputnik (N=4) N (%)
Arm pain	35 (50.7)	4 (50)	32 (50.8)	22 (45.8)	28 (58.3)	4 (40)	2 (50)
Injection site Pain	19 (27.5)	1 (12.5)	14 (22.2)	9 (18.8)	10 (20.8)	5 (50)	2 (50)
Injection site swelling	1 (1.4)	1 (12.5)	4 (6.3)	4 (8.3)	3 (6.2)	1 (10)	0 (0)
Swollen lymph nodes	1 (1.4)	0 (0)	1 (1.6)	1 (2.1)	1 (2.1)	0 (0)	0 (0)
Fatigue	17 (24.6)	2 (25)	22 (34.9)	14 (29.2)	15 (31.2)	2 (20)	1 (25)
Flu-like symptoms	14 (20.3)	0 (0)	6 (9.5)	7 (14.6)	7 (14.6)	5 (50)	0 (0)
Bone/muscle pain	23 (33.3)	3 (37.5)	10 (15.9)	9 (18.8)	11 (22.9)	2 (20)	2 (50)
Allergic reactions	0 (0)	0 (0)	0 (0)	2 (4.2)	5 (10.4)	0 (0)	1 (25)
Clotting	2 (2.9)	0 (0)	0 (0)	1 (2.1)	1 (2.1)	0 (0)	0 (0)

J & J: Johnson & Johnson

Table 5: Logistic regression analysis of independent predictors of lack of vaccination among healthcare workers (n=300), EL-Edwa central hospital, Minia governorate, January 2022 to April 2022

Predictors	Odds ratio	95% C.I.		P value
		Lower	Upper	
Gender	2.169	0.839	5.611	0.110
Qualification	0.819	0.319	2.104	0.678
Worrying about vaccine safety	7.504	2.671	21.078	< 0.0001
Disagreement that vaccine gives full protection against COVID-19 infection	4.99	1.866	13.343	0.001

In Ghana, Agyekum et al. (2021) discovered that 39.3% of HCWs were willing to receive the COVID-19 vaccines, whereas over half lacked acceptance.¹⁵ The elevated rate seen in the present study may be attributed to the timing of data collection. Prior to the commencement of the COVID-19 vaccination program, previous research was conducted. Subsequently, the actual administration of the vaccine, the availability of vaccines, convenient access to the service, satisfaction with the vaccination application process, and confidence in short-term safety can potentially enhance the acceptance rate.

Concerns regarding safety (side effects) were listed as the top two reasons for vaccine refusal; according to the current study, 64% of not-vaccinated study participants refused the vaccine due to fear of its side effects. In the study, almost 22% of people were suspicious about the vaccine's effectiveness. Based on research that was carried out by Shehata et al. (2022), a study conducted among HCWs in El-Gharbia governorate, Egypt, they were revealed that the

primary reason for vaccination refusal among Egyptian physicians was fear of negative side effects, which was reported by over 50% of physicians, followed by worries regarding the short duration of clinical trials conducted on the vaccine.¹⁶ Only one-third of physicians reported concerns about the safety as well as the efficacy of the vaccine. This finding was consistent with research conducted among nurses in Wuhan, China, where approximately 76% of unvaccinated nurses reported doubts regarding the efficacy, effectiveness, or safety of the vaccination.¹⁷

The primary generalized symptoms observed in this study were generalized weakness or fatigue (28.8%), followed by bone and muscle symptoms (23.5%) and flu-like (15.5). The present study's findings align with those of a study conducted by Jayadevan et al. (2021), which indicated that the most annoying general symptoms among Indian HCWs after COVID-19 vaccination were tiredness, myalgia, and fever.¹⁸

This finding corroborates that these symptoms are aligned with an immunological reaction often linked to vaccines.

This study demonstrated that the primary local effects associated with the COVID-19 vaccine were pain in the arm and soreness at the site of injection; the outcome was consistent with prior research conducted by Orebi et al. (2022); the side effects that were most frequently reported among HCWs at Tanta University Hospitals in Egypt were arm pain as well as injection site pain (65.4%).¹⁹ Concerning the duration of vaccine side effects, the majority (87%) indicated that the side effects lasted for less than two weeks. Orebi et al. (2022) conducted a study among Egyptian HCWs at Tanta University Hospitals.¹⁹ The study revealed that most HCWs (95.9%) reported experiencing adverse effects for less than two weeks.

The majority of the participants who took part in the study reported short-lived adverse effects that were gone within a week or two. The finding corroborates that most of the side effects following COVID-19 vaccination are temporary and resolve quickly on their own. None of the symptoms are severe to the extent that hospitalization is required. Based on numerous research, vaccine recipients commonly have little post-vaccine effects. The symptoms were mild, insignificant, and posed no threat to their lives²⁰⁻²² Approximately 54% of HCWs had more adverse effects after receiving the first dose of the vaccine compared to the second dose. The study revealed that individuals did not experience any additional side effects after receiving the second vaccination dose compared to the first dose.²⁰

There was statistically significant difference in receiving vaccination regarding gender as, 77.8% of not-vaccinated study participants were females while 22.2% of not-vaccinated study participants were males ($p = .013$). This finding agrees with another study in Egypt at Assiut University hospitals in which female HCWs had a 62% higher likelihood of vaccine refusal than their male counterparts.²³ This can be attributed to their heightened apprehension about potential adverse effects, such as infertility, severe side effects that could hinder their ability to fulfill familial responsibilities, or increased vulnerability to superstitions and misinformation propagated by the media. Conversely, males exhibited superior health-seeking behaviors and a greater appreciation for guidance on COVID-19 vaccines.^{5,24}

In the present study, physicians showed higher support for vaccination than other HCWs (43.9% acceptance across physicians contrasted to 33.7%, 14.8%, 7.6% among nurses, technicians and clerks, respectively). The results were consistent with a study conducted among HCWs in Assiut University Hospital, which revealed that physicians exhibited a higher level of acceptance towards vaccination compared to other HCWs in the present study (60.6% acceptance across physicians contrasted to 16.2% and 4.9% among nurses as well as workers, respectively).²³ In general, those with higher education levels tend to favor vaccination more favorably.^{12,24-26}

CONCLUSIONS

In general, there was a high rate of COVID-19 vaccination among HCWs at El-Edwa Central Hospital. Considering the vaccine is unsafe and doesn't give full protection against COVID-19 infection were the significant predictors of lack of vaccination among the study group.

Ethics Consideration

The study obtained all required approvals from the Institutional Review Board (or other appropriate ethics committee) of Minia University (approval number is 210/1:2022). All participants were informed about all steps of the study to be oriented by all data extracted from this study. All participants took part in the study voluntarily. Informed consent has been added at the beginning of the google form. Confidentiality and privacy of data were ensured.

Recommendations: Campaigns by HCWs should be conducted to increase the population awareness towards the importance of COVID-19 vaccine uptake and its importance. Further studies should be done such as interventional studies for KAP before and after intervention among HCWs towards COVID-19 vaccination.

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