

# ACCEPTANCE OF COVID-19 VACCINES AMONG NURSES

By

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## Abstract

**Introduction:** Nurses are among the most occupationally exposed groups to Corona Virus Disease -19 (COVID-19) infections and their protection is crucial. Currently, many types of vaccines are developed but there are still many issues related to their acceptance among different occupational groups. It is vital to investigate this issue for clarification of the problem and timely targeting of its roots, particularly among the highly exposed workers. **Aim of Work:** To estimate the level of vaccine acceptance among a group of nurses in Mansoura University Hospitals, Egypt, and to shed the light on vaccines acceptance associated factors, and the reasons for non-acceptance. **Materials and Methods:** This is an observational descriptive cross-sectional study that was conducted on 262 nurses working in Mansoura University Hospitals, Egypt, during the year 2021. Data were collected using an anonymous self-administered questionnaire. Vaccines' acceptance was questioned, and the reasons for not accepting the vaccines were ascertained. **Results:** Only 22.1% of nurses in Mansoura University Hospitals accepted to be vaccinated (4.2% already vaccinated and 17.9% are willing to take the vaccine) especially those with self-reported good health status [adjusted odds ratio (AOR) = 3.5 (1.5-8.1)]. The independent predictor on logistic regression is good/fair self-rated health with AOR= 3.5 (1.5-8.1). Concerns about vaccines safety and side effects were the most reported reasons for non-acceptance of vaccination. Vaccine safety concerns and distrust issues were reported. **Conclusion and Recommendations:** Being a male, previously infected, with good or fair self-rated health were associated

with more vaccine acceptance. Nurses' education and increasing awareness are required to correct misinformation about different types of COVID-19 vaccines and improve acceptance of nurses to vaccination. This would be a crucial preventive strategy that targets a highly exposed occupational group. This can be accomplished via health education sessions and increasing workers' motivation towards vaccination.

**Key words:** Nurses, COVID-19, Vaccination, Acceptance, Vaccines' safety and Vaccines side effects.

## Introduction

COVID-19 infection is a global health threat (Fisher et al., 2020). The pandemic is overwhelming the health system and draining a lot of resources (Nicola et al., 2020). Nurses are valuable human resources in health system, so their protection is a crucial issue, especially with their high vulnerability to infection (Phua et al., 2020). Non-specific preventive measures against COVID-19 infection include adequate ventilation, hand washing with soap and water or disinfectants, and respiratory hygiene such as covering nose and mouth (McIntosh et al., 2020). COVID-19 vaccination provides protection not only to the vaccinated individuals, but also to the general population if sufficient proportion of the population was vaccinated (Wu et al., 2014). Many vaccine varieties with different mechanisms of actions are available as recombinant protein vaccines, RNA vaccines, and vector-based vaccines. These vectors can be a virus or a non-pathogenic bacterium

(Wang et al., 2020). The area of COVID-19 vaccination is still new and lacking information, yet it is crucial in disease prevention. COVID-19 vaccine is freely available in Mansoura University Hospitals, and priority is given to all health care workers including nurses, despite of that, there is reluctance or some unacceptability to vaccination. Commonly reported reasons include lack of information about the vaccine and concerns about its side effects (Abdelhafiz et al., 2020).

## Aim of Work

To estimate the level of vaccine acceptance among a group of nurses in Mansoura University Hospitals, Egypt, and to shed the light on vaccines acceptance associated factors, and the reasons for non-acceptance.

## Materials and Methods

**Study design:** An observational descriptive cross-sectional study.

**Place and duration of the study:** The study was conducted on nurses

working in Mansoura University Hospitals, Egypt during the first two months of 2021.

#### **Study sample and pilot study:**

Sample size was calculated online using the Open epi program (<https://www.openepi.com/SampleSize/>). An internal pilot study on 50 nurses revealed that 20% of them accept to be vaccinated with COVID-19 vaccine. With 5% alpha error and 5% precision, then the calculated sample size was 246 nurses. The total number of nurses on duty in Mansoura University Hospitals is 2415 (1898 with Nursing Bachelor and 517 with Nursing Technical Diploma). A systematic random sample of 301 was selected (each 8th) and 262 nurses responded (response rate was 87.0 %).

**Study methods:** An anonymous Arabic self-administered questionnaire was developed after extensive literature review to collect the following data (Fisher et al., 2020; Nzaji et al., 2020):

1. Sociodemographic data (age, sex, marital status, qualification, annual household income, and residence).
2. Work information (occupation, specialty, and years of experience).
3. Knowledge about COVID-19 infection and expectations about the possibility of being infected, in addition to self-rated

general health. 4. Whether vaccinated or not and willingness to be vaccinated against COVID-19 in addition to reasons for negative answers.

Inclusion criteria were willingness to participate in the study and being a nurse on duty for at least one year at the time of data collection. Operational definition of COVID-19 vaccine acceptance is either being already vaccinated or willing to get the vaccine.

#### **Consent**

An informed oral consent was obtained from each participant in the study after thorough explanation of the aim of the study and the benefits behind it to the nurses' community and after ensuring confidentiality. Participants were allowed to respond anonymously to the questionnaire and in their own time and privacy.

#### **Ethical Approval**

Study proposal was approved by the Institutional Research Board (IRB), Faculty of Medicine, Mansoura University. Proposal code is R.21.01.1144.R1.R2.

#### **Data Management**

Data were collected, entered, and cleaned. Analysis was performed using

Statistical Package of Social Sciences (SPSS) software version 23 (SPSS Inc., Chicago, IL, United States of America). Categorical variables were presented as number and percent. Chi-square test was used for comparison between groups. Crude odds ratios (COR) and their 95% confidence intervals (CI) were calculated. Significant factors

associated with vaccine acceptance on bi-variate analysis were entered into multivariate logistic regression models using stepwise forward Wald method to detect the independent predictor of acceptance. AOR and their 95% CI were calculated.  $P \leq 0.05$  was considered statistically significant.

## Results

**Table 1: Nurses' Acceptance of COVID-19 vaccines and its variation with different parameters.**

Parameters	Total	Acceptance	p value	COR (95% CI)
Overall	262	58 (22.1) <sup>a</sup>		
<b>Age (years):</b>				
<30	107	19 (17.8)		1 (r)
≥30	155	39 (25.2)	0.2	1.6 (0.8-2.9)
<b>Sex:</b>				
Female	217	42 (19.4)		1 (r)
Male	45	16 (35.6)	0.02	2.3 (1.1-4.6)
<b>Residence:</b>				
Urban	77	20 (26.0)		1 (r)
Rural	185	38 (20.5)	0.3	0.7 (0.4-1.4)
<b>Marital status:</b>				
Unmarried	63	11 (17.5)		1 (r)
Married	199	47 (23.5)	0.3	1.5 (0.7-3.0)
<b>Income:</b>				
Insufficient	173	38 (22.0)		1 (r)
Sufficient	89	20 (22.5)	0.9	1.0 (0.7-3.0)
<b>Department:</b>				
Medical	43	11 (25.6)		1 (r)
Surgical	57	9 (15.8)	0.2	0.5 (0.2-1.5)
Others	162	38 (23.5)	0.8	0.9 (0.4-1.9)
<b>Duration of work (years):</b>				
<10	132	26 (19.7)		1 (r)
≥10	130	32 (24.6)	0.3	1.3 (0.7-2.4)
<b>Scientific qualification:</b>				
Nursing Diploma	169	35 (20.7)		1 (r)
Bachelor of nursing	93	23 (24.7)	0.5	1.3 (0.7-2.3)
<b>Training on COVID-19:</b>				
Yes	178	43 (24.2)		1 (r)
NO	84	15 (17.9)	0.3	0.7 (0.4-1.3)
<b>Infection expectation:</b>				
NO	55	7 (12.7)		1 (r)
Mild/				
Moderate	60	12 (20.0)	0.3	1.7 (0.6-4.7)
Severe	42	9 (21.4)	0.3	1.9 (0.6-5.5)
Already infected	105	30 (28.6)	0.02	2.7 (1.1-6.7)
<b>Self-rated health status:</b>				
Poor	73	7 (9.6)		1 (r)
Good/fair	189	51 (27.0)	0.002	3.5 (1.5-8.1)

<sup>a</sup>:4.2% already vaccinated and 17.9% are willing to take the vaccine.

CI=confidence interval.

COR=Crude odds ratio.

r=reference category.

Table 1 showed sociodemographic, work related, and other determinants of nurses' acceptance to COVID-19 vaccines. A total of 22.1% of study participants accepted vaccines (4.2% already vaccinated and 17.9% are willing to take the vaccine). Being a male, previously infected, with good or fair self-rated health were associated with more vaccine acceptance with COR, 2.3, 2.7 and 3.5; respectively.

**Table 2: Multivariate logistic regression analysis of independent predictor of vaccine acceptance.**

Predictors	$\beta$	p value	AOR (95% CI)
Self-rated health status: Poor Good/fair	1.25	<b>0.004</b>	1 (r) 3.5 (1.5-8.1)
Constant	-2.2		
Model c <sup>2</sup>	10.5 ( <b>p ≤ 0.001</b> )		
% Correctly predicted	77.9		

AOR=Adjusted odds ratio.

CI=confidence interval.

r=reference category.

Table 2 showed that the independent predictor on logistic regression is good/fair self-rated health with AOR= 3.5 (1.5-8.1). This can predict 77.9% of vaccine acceptance.

**Table 3: Reasons for not accepting vaccines (204 nurses are not accepting the vaccines).**

Reasons <sup>a</sup>	No (%)
Safety issues/ concerns about side effects	153 (75.0)
Efficacy issues	151 (74.0)
Distrust in vaccine manufacturing companies, or the vaccine itself	123 (60.3)
Lack of information regarding COVID-19 vaccine	87 (42.6)
Recommendation from health care worker due to incompatibility to health	49 (24.0)
Bad previous experience with influenza vaccines	26 (12.7)
Presuming that it is too early to be vaccinated	15 (7.4)
Dislike injections	15 (7.4)
Assuming self to be not at risk	12 (5.9)

<sup>a</sup> :Categories are not mutually exclusive.

Table 3 showed that the most common causes of not accepting vaccines are safety issues and side effects considerations. This is followed by trust issues related to current COVID-19 vaccines manufacture, and lack of information.

## Discussion

Nurses are largely exposed to COVID-19 infection. Their vaccination is considered a crucial preventive strategy. Till now, there are still some issues around COVID-19 vaccines' acceptance among nurses. This needed to be investigated. The current study found that only 22.1% of nurses in Mansoura University Hospitals, Egypt, accept COVID-19 vaccines (Table 1). A systematic review stated that COVID-19 vaccine acceptance rates among doctors and nurses varied from as low as 27.7% in Congo to as high as 78.1% in Israel (Sallam, 2021). Another research work that included 35 studies with sample sizes ranging from 123 to 16,158 reported that vaccine hesitancy among health care workers including nurses ranged from 4.3 % to 72 % (Biswas et al., 2021). A cross sectional survey concluded that 40 % of nurses in China accepted COVID-19 vaccination (Wang et al., 2020). According to the present study, 4.2 % were already vaccinated at the time of data collection (Table 1). This is considered by far very low in terms of vaccine coverage. Vaccine is freely available in Mansoura University Hospitals and health care workers including nurses are given top

priority to get the vaccine. A previous study stated that COVID-19 vaccine coverage among nursing staff reached 37.5% in the United States (Gharpure et al., 2021).

The present work stated that 17.9% of nurses were willing to be vaccinated (Table 1). This is also considered low compared to other studies that estimated hypothetical vaccine acceptance to be 76.9 % among French healthcare workers during the first pandemic wave (Gagneux-Brunon et al., 2021). This could be low awareness about importance and safety of the vaccine.

Good self-rated general health was detected to be an independent predictor in among the studied group. AOR (95% CI) was 3.5 (1.5-8.1) (Table 2). This could be partially explained by the Health Belief Model (HMB). It has four components; 1. Perceived susceptibility, which is expected to be low in those with good self-rated general health. 2. Perceived severity, which may be high due to presumed increased concerns about health. 3. Perceived barriers which are low due to vaccine availability. 4. Perceived benefits of vaccination which are expected to be high among with good health status. The overall sum of health belief model in those with high

self-rated general health is in the favour of getting vaccinated (Zampetakis and Melas, 2021). Another explanation might be the association between good general health and awareness about healthy habits including specific prevention of diseases by vaccination (Banik et al., 2021). This agreed with a study done in United States which stated that among health care workers with no chronic medical conditions and average general health, 7.4 % refused vaccine, 36 % accepted, and 57 % did not give a conclusive answer (Shekhar et al., 2021).

According to the present study, male nurses and those who are previously infected were more likely to accept COVID-19 vaccination (Table 1). This was in accordance with a systematic review done in United States, which stated that doctoral degree holders and older male health care workers were more likely to accept the vaccine than others (Biswas et al., 2021). Also, it was in harmony with a study done by Qattan et al., 2021 on acceptability of COVID-19 vaccine among healthcare workers in the Kingdom of Saudi Arabia who documented that being a male and at higher infection risk perception was more likely to be associated with

vaccine acceptance. Male sex is reported to be positively associated with vaccine acceptance among health care workers (Dror et al., 2020). It is possible that being a male might be associated to holding positions with more exposure to infection, and that females may have more safety concerns given the fact that most female nurses working in Mansoura University Hospitals are in the reproductive age and assigned duties not in direct contact with COVID-19 patients.

A research work done on health care workers whose participants were more than 60% nurses, reported that being infected during COVID-19 pandemic was associated with more psychological impacts including generalized anxiety disorders (Temsah et al., 2020). From authors' perspective, this explains more willingness to be vaccinated among previously infected nurses.

The current study revealed that among the reasons for not accepting the vaccine, concerns about vaccine side effects were ranked the highest (75%), followed by assuming ineffectiveness of the vaccines (74%), followed by distrust in vaccine producing companies or the vaccine itself (60.3%) (Table3). Uncertainties that

may surround vaccine efficacy, safety issues, strict time schedules, in addition to believing sometimes that it might not be necessary were reported by some studies as reasons for vaccine hesitancy among health care workers (Wang et al., 2020). A national survey performed on 1000 people in United States reported that, regarding COVID-19 vaccines' acceptance, people evaluate benefits and side effects independently (Kaplan and Milstein, 2021). Some studies addressed insufficient health care workers' knowledge about the vaccine as the most important factor for vaccine hesitancy (Papagiannis et al., 2020). Dror et al., 2020 in their study on vaccine hesitancy: the next challenge in the fight against COVID-19 concluded that nurses believed that COVID-19 is a mild illness in comparison to issues about safety and effectiveness of the vaccine which was documented as a limiting factor against increasing COVID-19 vaccination coverage among hospitals staff. Uncertainties about the duration of protection provided by COVID-19 vaccine were added to safety and efficacy concerns and documented as reasons for vaccine hesitancy among nurses (Kwok et al., 2021).

Some studies hypothesized new reasons such as negative effects of social media in misinforming health care workers in addition to rumours on vaccine quality (Nzaji et al., 2020). Authors believe that under regular conditions, social media should have a minimal role in forming the knowledge of professional people such as health care workers, but under the global stress from the pandemic, these hypotheses might be a possibility. Some studies addressed distrust in pharmaceutical companies in addition to safety and efficacy concerns as disabling factors against vaccine acceptability among health care workers (Di Gennaro et al., 2021). Many other research work addressed COVID-19 vaccine safety and effectiveness as major limiting factors for vaccine acceptability by health care workers (Eguia et al., 2021; Kuter et al., 2021; Ledda et al., 2021; Shekhar et al., 2021). A national Egyptian survey on COVID-19 vaccine acceptability among health care workers reported that 13.5% accepted the vaccine and that concerns about safety and efficacy were significant limiting factors against high vaccination (Mohamed-Hussein et al., 2021).

**Conclusion:** COVID-19 vaccines

acceptability among nurses in Mansoura University Hospitals is relatively low for a high-risk population. Most of the attributed reasons can be managed by health education campaigns.

**Recommendations:** Education is of crucial importance in the overall process of protection of nurses against COVID-19 infection. Education should target the most relevant issues to increase nurses' awareness for prevention of occupational and community-acquired COVID-19 infections.

**Study limitations:** The current study has some limitations; being a self-reported cross section survey, that was conducted in a single centre. Some types of bias can be present such as Neyman's and recall bias.

### **Conflict of interest**

Authors declare that there is no conflict of interest.

### **Data availability statement**

Data are available upon reasonable request from the corresponding author.

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