



# COVID-19 vaccine acceptance among Libyan health care workers: a cross-sectional study in western Libya

Nasrien Elfarrak<sup>1\*</sup>, Suhila Atwier<sup>2</sup>, Entesar rajeb Knaz<sup>3</sup>, Najwa Sakkah<sup>4</sup>, Hanan atwier<sup>5</sup>, Hana fahelbum<sup>6</sup>, Nesren Jaaida<sup>7</sup>

1. National Medical Research Center, Libya Email: nesrenali84@yahoo.co

2. National Medical Research Center

3. National Medical Research Center

4 Assabria clinic Az-zawia Libya

5. Department of medical laboratory, Faculty of medical technology, University of Zawia

6- Faculty of medicine university of Zawia

7. Department of pharmaceutics, faculty of pharmacy -Zawia University: n.jaaida@zu.edu.ly

---

## ABSTRACT

---

**Background:** Numerous rumors and facts regarding the Corona virus vaccines have been circulating since their introduction, and these have undoubtedly affected people, including health sector workers. A significant portion of consumers refused the COVID-19 immunization as a result of false information regarding the vaccine being circulated on social media. This study aimed to evaluate the acceptance rate of COVID-19 vaccination among Libyan health sector workers.

**Method:** A cross-sectional study was conducted among 200 participants employed in both the public and private health care sectors in the north-west of Libya. A self-administered questionnaire written in Arabic was the study instrument used to collect data. SPSS Version 25 was used to statistically analyze the gathered data.

**Result:** The overall acceptance of the COVID-19 vaccine was 45%, with a significant difference between government and private places of work ( $p = 0.008$ ). Individuals used social media websites as sources of their information (OR 0.078, 95% CL 0.013–0.471) were less likely to accept the vaccine in comparison to those with internet search websites.

**Conclusion:** Libyan health care worker's hesitancy to receive the COVID-19 immunization is a major problem. The acceptance of vaccines by health care workers was influenced by numerous factors. The most significant of these are the lack of information from reliable sources, a lack of confidence in the vaccine's safety, and concern about potential complications in the future. It must pay more attention to conduct educational programs that will improve health care worker's attitudes regarding receiving the COVID-19 vaccine by raising awareness and providing reassurance.

---

**Key words:** COVID-19, vaccine, acceptance, healthcare workers, Libya.

---



Online ISSN: 2413-6096

<http://www.ljmr.com.ly/>

Citation. Elfarrah . Nasrien , COVID-19 vaccine acceptance among Libyan health care workers: a cross-sectional study in western Libya

<https://doi.org/10.54361/ljmr.17-10>

Received: 01/03/23accepted: 14/04/23; published: 30/06/23

Copyright ©Libyan Journal of Medical Research (LJMR) 2023. Open Access. Some rights reserved. This work is available under the CC BY license

<https://creativecommons.org/licenses/by-nc-sa/3.0/ig>

## Introduction

Since December 2019, the Corona virus has caused many diseases, ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and severe acute respiratory syndrome (SARS). This virus spread rapidly and widely around the world, resulting in thousands of deaths that made the World Health Organization (WHO) declare a pandemic on March 12, 2020, that must be confronted by taking precautionary measures until it is gone or a vaccine is available for it. [1]

There are several COVID-19 vaccines that have been approved by the WHO for use (based on the emergency use authorization protocol). The mass vaccination program started in early December 2020, and the number of vaccination doses given is being updated on the COVID-19 dashboard. WHO's emergency authorization process determines whether a product can be recommended for use based on all available data on its safety, efficacy and suitability for use in low and middle-income countries. Vaccines are evaluated for meeting accepted standards for quality, safety and efficacy using data from clinical trials,

manufacturing standards, and quality control processes. The assessment weighs the threat posed by the emergency against the benefit of using the product. [2]

As of November 26, 2021, the following vaccines had been authorized for emergency use: Pfizer/bioNTech collaboration, December 31, 2020. SII/COVISHIELD and Astrazeneca/AZD 1222 vaccine, February 16, 2021 janssen/Ad26 vaccine. Cov2.s developed by Johnson and Johnson, March 12, 2021 Moderna vaccine against COVID-19 (mRNA1273) on April 30, 2021 Sino pharmaceutical for covid-19, 7 May 2021. Sinovac-coronovac for COVID-19, on June 1, 2021. Covaxin BBV152 vaccine, Spice Biotech, on November 3, 2021. [3] Understanding the elements that promote and restrict vaccine uptake is crucial for ensuring the success of any immunization campaign. [4]

Healthcare workers (HCWs) reported vaccine hesitancy ranging from 27.7 to 78.1% in the context of the COVID-19 vaccine, according to studies from throughout the world. Major problems

have been recognized as safety issues, potential side effects, and the pace of vaccine development. [5]

Social media has become saturated with criticism comments criticizing people who are delaying being vaccinated against the coronavirus, but these responses are more harmful than helpful. One of the negative consequences of the so-called information epidemic that came along with the onset of the COVID-19 pandemic is the rejection and resistance to vaccines, the hesitation in taking them, and the dread of them. A few of them are false, while the majority fall under the category of rumors, spreading information about the pandemic and everything associated with it—including its causes, modes of transmission, origin, preventative measures, and vaccines—and making the recipient ill. [3]

Since health sectors worker are the group most at risk of contracting the virus and the first point of contact for convincing the general public to accept the vaccine, this study focused on health sector workers in the western part of Libya to find out the extent of their acceptance of the vaccine and the reasons for their resistance.

## Method and material

### Study setting and design

An observational cross-sectional study was conducted on 200 workers in the government and private health sectors

(hospitals, polyclinics and community pharmacies) located in the north-west of Libya. All categories of doctors, pharmacists, nurses, technicians and administrators were included in this study. In order to assess the acceptability of the research, a pilot study was conducted among 15 health care workers. The study was conducted over a period of three months, from June 2022 to September 2022.

### Study instrument

Based on a literature study, [6,7,8] self-administered survey was created and distributed to each participant. The questionnaire was written in understandable Arabic. It was divided into three primary sections, the first of which dealt with demographic data (gender, age, sex, health status, degree of education, employer, and place of employment). The second section related to vaccine acceptance/ refusal and previous infection with the Corona virus). The questionnaire's final section assesses respondent sources of information.

### Data analysis

All data was downloaded by Microsoft Excel and analyzed using SPSS V25. Descriptive statistics were obtained by calculating the mean and standard deviation for quantitative data and the number and percentage for qualitative data. The difference was considered statistically significant at  $p < 0.05$ . Binary logistic regression analysis of factors associated with vaccine acceptance was applied.

### Results

Demographic characteristics

A total of 200 questionnaires were analyzed for the most aged group (25–49). Most participants were female

(75.1%). Participants made up of 75% graduates, 8% master's students, and 14.6% undergrads. About 20% of participants had chronic diseases. (Table 1).

**Table 1:** Demographic characteristics and health condition of participants.

Variable	N (%)	Covid -19 acceptance among health care workers		p-value
		Yes N (%)	No N (%)	
Sex				0.439
Male	50 (24.9)	25 (50.0)	25 (50.0)	
Female	150(75.1)	65 (43.3)	85 (56.6)	
Nationality				0.201
Libyan	198 (99.0)	88 (44.4)	110 (55.6)	
Not Libyan	2 (1.0)	2 (100.0)	0 (0.0)	
Age (Years)				0.273
18-35	117 (58.4)	47 (40.1)	70 (59.9)	
36-45	68 (34.0)	36 (52.9)	32 (47.1)	
46-65	14 (7.0)	7 (50.0)	7 (50.0)	
>= 66	1 (0.5)	0 (0.0)	1 (100.0)	
Education level				0.242
Undergraduate	29 (14.5)	11 (37.9)	18 (62.1)	
Graduate	151 (75.5)	65(43.0)	86 (56.9)	
master	16 (8.0)	10 (62.5)	6(37.5)	
phD	4 (2.0)	3 (75.0)	1(25.0)	
Place of work				<b>0.008</b>
Government	188 (94.0)	90 (47.8)	98 (52.1)	
Private	12 (6.0)	1 (8.3)	11 (91.7)	
Health Condition	N = 62			0.458

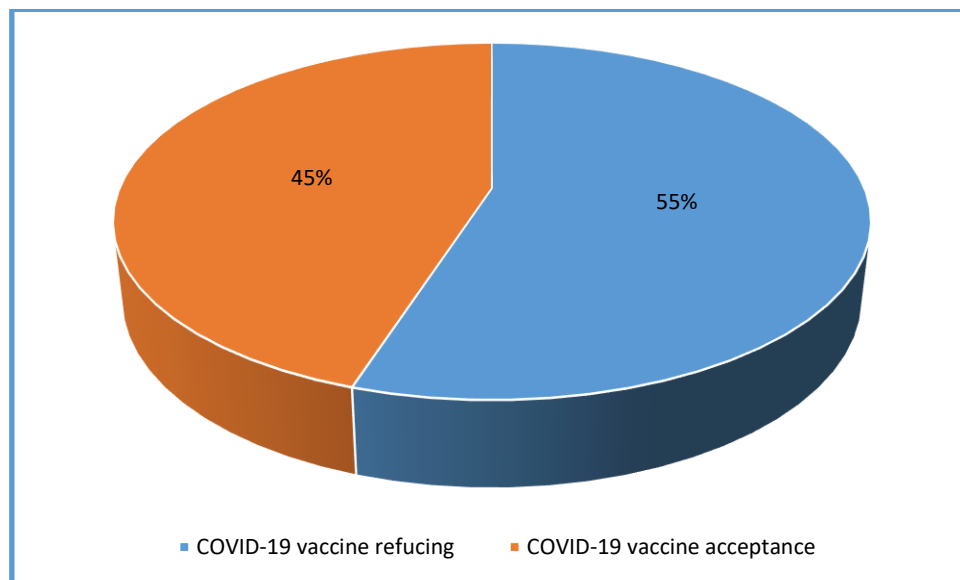
pregnancy	14 (22.6)	3 (21.4)	11 (78.6)	
Brest feeding	12 (19.4)	6 (50.0)	6 (50.0)	
Cardiovascular disorder	7 (11.3)	1 (14.3)	6 (85.7)	
Diabetes	6 (9.7)	1 (16.7)	5 (83.3)	
Asthma	7 (11.3)	2 (28.6)	5 (71.4)	
Other chronic disease	16 (25.8)	7 (43.8)	9 (56.3)	

**Acceptance of the COVID-19 vaccine among health care workers and their previous infection.**

The overall acceptance of the COVID-19 vaccine was 45%, with significant differences by workplace ( $p = 0.008$ ), information source ( $p = 0.013$ ), and vaccination recommendation ( $p 0.001$ ).

The acceptance of COVID-19, however, did not differ significantly by gender, nationality, age, degree of education, or state of health ( $p > 0.05$ ) (Table 1).

**Figure 1:** percentage of vaccine acceptance and refusing among participant.



The Corona virus had previously infected around 66.7 percent of participants; the majority of them had a moderate illness, and 50% of them refused the vaccine.

Following vaccination, 58.1% of individuals experienced some adverse effects, the majority of which were mild or severe (table 2)

**Table2:** vaccine related characteristic among participant.

Previous infection by corona virus	N (%)	Yes N (%)	No N (%)	p-value
yes	133 (66.5)	66 (49.6)	67 (50.4)	0.089
no	67 (33.5)	25 (37.3)	42 (62.7)	
Severity of infection				0.060
sever	24 (17.8)	7 (29.2)	17 (70.8)	
moderate	65 (49.6)	33 (50.7)	32 (49.3)	
mild	44 (32.6)	26 (59.1)	18 (40.9)	
Type of vaccine				
Pfizer-BioNTech covid-19 vaccine	42 (46.7)	42 (100.0)	0 (0.0)	
Oxford-AstraZeneca covid-19 vaccine	27 (30.0)	27 (100.0)	0 (0.0)	
Sputnik v covid-19 vaccine	12 (13.3)	12 (100.0)	0 (0.0)	
Sinopharm covid-19 vaccine	9 (10.0)	9 (100.0)	0 (0.0)	
Side effect of vaccine				
yes	53 (58.1)	53(100.0)	0 (0.0)	
no	37 (41.9)	37 (100.0)	0 (0.0)	
Corona infection after get the vaccine				
yes	39 (45.3)	39 (100.0)	0 (0.0)	
no	47 (54.7)	47 (100.0)	0 (0.0)	
Reasons for refusing the vaccine				
Lack of confidence of vaccine safety				
yes	78 (91.8)	0 (0.0)	78 (100.0)	
no	7 (8.2)	0 (0.0)	7 (100.0)	

Want to take another type of vaccine that not exist in our country				
yes	34 (55.7)	0 (0.0)	34 (100.0)	
no	27 (44.3)	0 (0.0)	27 (100.0)	
You Thinking , it is ineffective				
yes	66 (93.0)	0 (0.0)	66 (100.0)	
no	5 (7.0)	0 (0.0)	5 (100.0)	
Fear of future complications				
yes	79 (94.0)	0 (0.0)	79 (100.0)	
no	5 (6.0)	0 (0.0)	5 (100.0)	
Religion reasons				
yes	4 (6.7)	0 (0.0)	4 (100.0)	
no	56 (93.3)	0 (0.0)	56 (100.0)	
Do you advise other people to get vaccine				
Yes	105 (52.2)	76 (72.3)	17 (16.1)	
No	95 (47.8)	13 (13.6)	82 (86.3)	

### Respondents source of information.

More than half of participants (54 %) utilize social media as sources of their information regarding corona virus

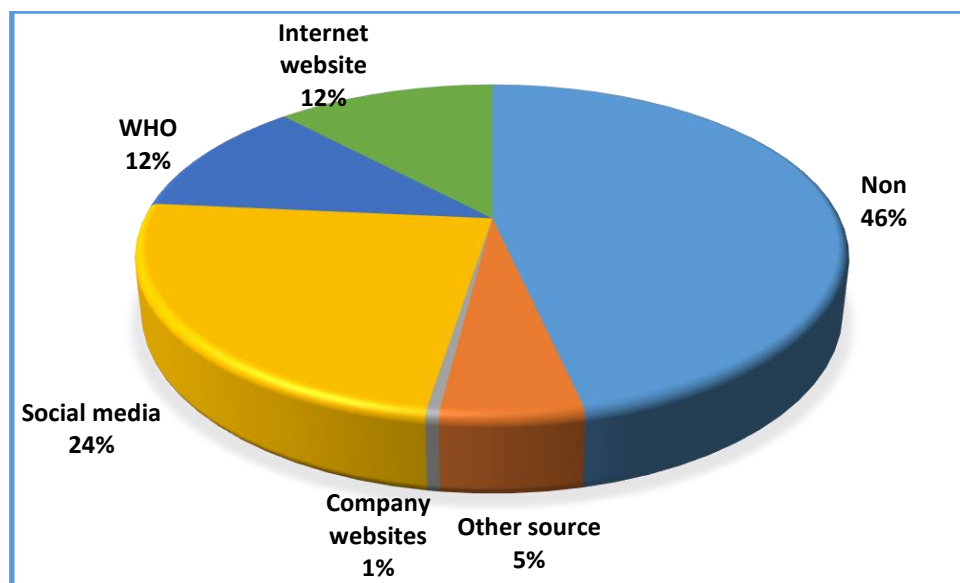
vaccination, moreover 46% of respondents does not depend on any source of information.

**Table 3:** Participants sources of information.

Source of information	No. of respondent	Percentage
Internet website	24	19%
WHO	23	18%
Social media	48	54%
Company websites	1	1%

Other source	11		8%
Non	98		46%

**Figure 2.** Participants source of information according to vaccine acceptance.



**Table 3:** Binary logistic regression analysis of factors associated with vaccine acceptance.

Variable	Odds Ratio (95% CI)	p-value
Place of work		
government	Ref	
private	10.102 (1.279 –79.819)	0.028
The source of information		
Internet websites	Ref	
WHO	0.311 (0.061-1.598)	0.162
Social media	0.078(0.013-0.471)	0.005
Company websites	0.159(0.028-0.899)	0.037
Other source	0.000 (0.000-0.000)	1.000



Are you advice other people to get vaccine		
yes	Ref	
no	122.196 (34.439-433.572)	<0.001

In the bivariate logistic regression analysis, those who work in the private sector were found to be more likely to accept the vaccine than those who work in the public sector (OR 10.102, 95% CI 1.279-79.819).

Comparatively to those with internet search websites, individuals with official company websites (OR 0.159, 95% CI 0.028-0.899) or social media websites (OR 0.078, 95% CI 0.013-0.471) were less likely to receive the vaccine.

## Discussion

The health sector is considered the most exposed to the risk of infection with the emerging Corona virus and its complications due to their contact with patients. On the other hand, health practitioners are an important source for educating people about the Corona virus infection and the necessity of using vaccines. [9] This study aimed to determine the acceptance of the Corona virus vaccine among health sector workers in the western region of Libya. Despite the fact that many of them had been infected with the Corona virus, It was found that more than half of participants (55%) had not taken the vaccine, even though they had a higher education level. In an earlier investigation, the percentage of people who had received the Corona vaccination and the degree of awareness of the vaccine's importance were included. The results showed that 75% of the participants were willing to receive the vaccine. despite this The number of people who refused the vaccine increased as a

result of the propagation of vaccine myths, which also raised the dread of many. Additionally, the study found no statistically significant differences among the general population, medical students, doctors and paramedics. [6]

Not only in Libya but also in neighboring countries, there has been a decrease in the percentage of vaccine acceptance among health care workers. where an Egyptian study reported that the percentage of hesitant people was 41.9% and that of refusing people was 32%. [3] Additionally, according to a recent comprehensive evaluation, African health care workers generally have low levels of acceptance for the COVID-19 vaccine. [10] A case in point is the decline in the vaccination acceptance rate noted in Kongo, where only 28% of healthcare workers were willing to receive a vaccination. [11]

On the contrary, Earlier studies reported that a high willingness percentage to vaccine ranged from 60 to 90% among physicians in Greece, France and KSA. [12,13,14,15] Similary, according to a US study, healthcare professionals who have direct patient contact, like doctors and nurses, are more likely to receive the COVID-19 vaccine than those who only interact with patients indirectly. [16]

There are many reasons for refusing COVID-19 vaccinations, including: lack of confidence in the safety and effectiveness of the vaccine; vaccine uptake is linked to vaccine trust, making it one of the key characteristics of vaccine reluctance. [17]

believe that the long-term adverse effects of this vaccine are still unknown because it was developed with new technology not previously used. Particularly in Libya, there is a lack of knowledge of vaccine components among health care workers and a lack of confidence in the health sector, which results in the use of unreliable sources of information. Thus, during mass vaccination programs, the government and decision-makers played a crucial role in fostering and maintaining confidence in both the safety and efficacy of the vaccines. [18]

Using dubious sources of information was a major concern, with 48 out of 200 participants using social media as their information source. Additionally, 98 participants did not depend on any sources of information, leading to poor knowledge and understanding of corona vaccination and refusing to accept the COVID-19 vaccine. Trust in information sources was crucial for vaccine acceptance. [19] A study explained that those who received their knowledge from the media had the most negative attitudes toward the COVID-19 vaccine. Although those who obtained their information from peer-reviewed scientific journals tended to conclude that this was the most positive perception. [20]

A bivariate logistic regression study revealed that people who work in the private sector are more likely to accept the vaccine than those who work in the public sector. This is consistent with a study from Cyprus that found nurses employed in the private health sector had higher intentions of receiving the COVID-19 immunization

than those employed in the public sector. [21] Furthermore, compared to employees in the public health sector, health care workers from the private health sector were more inclined to accept the third dosage of the COVID-19 vaccination, according to a cross-sectional study from Jordan. [22] This might be accounted for by variations in educational attainment and follow-up procedures at private hospitals. [7]

It is surprising that a high proportion of participants (N = 105) encouraged vaccinations even though the vaccination rate among participants did not reach 50%. Moreover, about half of the participants do not have sufficient information and there are those who rely on unreliable sources of information. This lies in the weakness of convincing the general public and the failure to educate them about vaccinations.

## Conclusion

In conclusion, limited acceptability of the COVID-19 vaccination among healthcare workers can be attributed to a lack of confident information and comprehension of vaccine components and technology. The health sector should establish educational training programs to increase the education level of health sector workers about vaccine components, manufacture and development, which in turn will contribute to raising awareness among people.

## References

1. Sanche S, Lin YT, Xu C, Romero-Severson E, Hengartner N, Ke R. High Contagiousness and Rapid Spread of Severe Acute Respiratory Syndrome Coronavirus 2. *Emerg Infect Dis.* 2020 Jul;26(7):1470-1477. doi: 10.3201/eid2607.200282. Epub 2020 Jun 21. PMID: 32255761; PMCID: PMC7323562.
2. World health organization. [https://www.who.int/emergencies/diseases/novel-coronavirus-2019?adgroupsurvey={adgroupsurvey}&clid=Cj0KCQjw4s-kBhDqARIsAN-ipH1TAoS-4CzNhEb\\_QEmICDTcfbiiqrjG-V3yqExHcjJ1nqNgwHadKYaAjZPEALw\\_wcB](https://www.who.int/emergencies/diseases/novel-coronavirus-2019?adgroupsurvey={adgroupsurvey}&clid=Cj0KCQjw4s-kBhDqARIsAN-ipH1TAoS-4CzNhEb_QEmICDTcfbiiqrjG-V3yqExHcjJ1nqNgwHadKYaAjZPEALw_wcB). Accessed on 23-3-2023.
3. El-Sokkary RH, El Seifi OS, Hassan HM, Mortada EM, Hashem MK, Gadelrab MRMA, Tash RME. Predictors of COVID-19 vaccine hesitancy among Egyptian healthcare workers: a cross-sectional study. *BMC Infect Dis.* 2021 Aug 5;21(1):762. doi: 10.1186/s12879-021-06392-1. PMID: 34353279; PMCID: PMC8341553.
4. Mehta, K., Dhaliwal, B. K., Zodpey, S., Loisate, S., Banerjee, P., Sengupta, P., ... & Shet, A. COVID-19 vaccine acceptance among healthcare workers in India: Results from a cross-sectional survey. *PLOS Global Public Health*, 2022, 2(7), e0000661.
5. Sallam M. COVID-19 Vaccine Hesitancy Worldwide: A Concise Systematic Review of Vaccine Acceptance Rates. *Vaccines (Basel)*. 2021 Feb 16;9(2):160. doi: 10.3390/vaccines9020160. PMID: 33669441; PMCID: PMC7920465.
6. Elhadi, M., Alsoufi, A., Alhadi, A. *et al.* Knowledge, attitude, and acceptance of healthcare workers and the public regarding the COVID-19 vaccine: a cross-sectional study. *BMC Public Health* 21, 955 (2021). <https://doi.org/10.1186/s12889-021-10987-3>
7. Alhassan, R.K., Aberese-Ako, M., Doegah, P.T. *et al.* COVID-19 vaccine hesitancy among the adult population in Ghana: evidence from a pre-vaccination rollout survey. *Trop Med Health* 49, 96 (2021). <https://doi.org/10.1186/s41182-021-00357-5>
8. Malik, A., Malik, J., & Ishaq, U., Acceptance of COVID-19 vaccine in Pakistan among health care workers. *PloS one*, (2021) 16(9), e0257237.

9. Yao M, Gu X, Mo Y, Xia C, Tang L. The Role of Health Education in Vaccination Nursing. *J Healthc Eng.* 2022 Apr 18;2022:6078846. doi: 10.1155/2022/6078846. PMID: 35480151; PMCID: PMC9038392.

10. Figa Z, Temesgen T, Zemeskel AG, Ganta M, Alemu A, Abebe M, Ashuro Z. Acceptance of COVID-19 vaccine among healthcare workers in Africa, systematic review and meta-analysis. *Public Health Pract (Oxf).* 2022 Nov 23;4:100343. doi: 10.1016/j.puhip.2022.100343. PMID: 36438628; PMCID: PMC9681992.

11. Kabamba Nzaji M, Kabamba Ngombe L, Ngoie Mwamba G, Banza Ndala DB, Mbidi Miema J, Luhata Lungoyo C, Lora Mwimba B, Cikomola Mwana Bene A, Mukamba Musenga E. Acceptability of Vaccination Against COVID-19 Among Healthcare Workers in the Democratic Republic of the Congo. *Pragmat Obs Res.* 2020 Oct 29;11:103-109. doi: 10.2147/POR.S271096. PMID: 33154695; PMCID: PMC7605960.

12. Papagiannis D, Malli F, Raptis DG, Papathanasiou IV, Fradelos EC, Daniil Z, Rachiotis G, Gourgoulialis KI. Assessment of Knowledge, Attitudes, and Practices towards New Coronavirus (SARS-CoV-2) of

Health Care Professionals in Greece before the Outbreak Period. *Int J Environ Res Public Health.* 2020 Jul 8;17(14):4925. doi: 10.3390/ijerph17144925. PMID: 32650614; PMCID: PMC7400230.

13. Gagneux-Brunon A, Detoc M, Bruel S, Tardy B, Rozaire O, Frappe P, Botelho-Nevers E. Intention to get vaccinations against COVID-19 in French healthcare workers during the first pandemic wave: a cross-sectional survey. *J Hosp Infect.* 2021 Feb;108:168-173. doi: 10.1016/j.jhin.2020.11.020. Epub 2020 Nov 28. PMID: 33259883; PMCID: PMC7699157.

14. Verger P, Fressard L, Collange F, Gautier A, Jestin C, Launay O, Raude J, Pulcini C, Peretti-Watel P. Vaccine Hesitancy Among General Practitioners and Its Determinants During Controversies: A National Cross-sectional Survey in France. *EBioMedicine.* 2015 Jun 23;2(8):891-7. doi: 10.1016/j.ebiom.2015.06.018. PMID: 26425696; PMCID: PMC4563133.

15. Al-Mohaithef M, Padhi BK. Determinants of COVID-19 Vaccine Acceptance in Saudi Arabia: A Web-Based National Survey. *J Multidiscip Healthc.*

2020 Nov 20;13:1657-1663. doi:  
10.2147/JMDH.S276771. PMID: 33262600;  
PMCID: PMC7686470.

16. Green-McKenzie J, Shofer FS, Momplaisir F, Kuter BJ, Kruse G, Bialal U, Behta M, O'Donnell J, Al-Ramahi N, Kasbekar N, Sullivan P, Okala P, Brennan PJ. Factors Associated With COVID-19 Vaccine Receipt by Health Care Personnel at a Major Academic Hospital During the First Months of Vaccine Availability. *JAMA Netw Open*. 2021 Dec 1;4(12):e2136582. doi:

10.1001/jamanetworkopen.2021.36582.  
Erratum in: *JAMA Netw Open*. 2022 Jan 4;5(1):e2147879. PMID: 34851399;  
PMCID: PMC8637254.

17. Latkin CA, Dayton L, Yi G, Konstantopoulos A, Boodram B. Trust in a COVID-19 vaccine in the U.S.: A social-ecological perspective. *Soc Sci Med*. 2021 Feb;270:113684. doi:  
10.1016/j.socscimed.2021.113684. Epub 2021 Jan 8. PMID: 33485008; PMCID: PMC7834519.

18. Vergara RJD, Sarmiento PJD, Lagman JDN. Building public trust: a response to COVID-19 vaccine hesitancy predicament. *J Public Health*. 2021;43(2):e291–2.

19. Viswanath K, Bekalu M, Dhawan D, Pinnamaneni R, Lang J, McCloud R. Individual and social determinants of COVID-19 vaccine uptake. *BMC Public Health*. 2021;21(1):1–10.

20. Polit DF, Yang F. Measurement and the measurement of change: a primer for the health professions. Wolters Kluwer Philadelphia, PA; 2016.

21. Fakonti G, Kyprianidou M, Toumbis G, Giannakou K. Attitudes and Acceptance of COVID-19 Vaccination Among Nurses and Midwives in Cyprus: A Cross-Sectional Survey. *Front Public Health*. 2021 Jun 16;9:656138. doi:  
10.3389/fpubh.2021.656138. PMID:  
34222170; PMCID: PMC8244901.

22. Lubad, M.A.; Abu-Helalah, M.A.; Alahmad, I.F.; Al-Tamimi, M.M.; QawaQzeh, M.S.; Al-kharabsheh, A.M.; Alzoubi, H.; Alnawafleh, A.H.; Kheirallah, K.A. Willingness of Healthcare Workers to Recommend or Receive a Third COVID-19 Vaccine Dose: A Cross-Sectional Study from Jordan. *Infect. Dis. Rep.* 2023, 15, 210-221.  
<https://doi.org/10.3390/idr15020022>.