

Prevalence and determinants of vaccine hesitancy for coronavirus disease 2019 vaccine among healthcare workers of tertiary care center in North India



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ABSTRACT

Background: The coronavirus disease 2019 (COVID-19) pandemic has dramatically affected the lives of people worldwide. Countries and citizens are battling with the virus as well as financial losses at the same time. In these gloomy times vaccine against COVID-19 brought some ray of hope. Vaccine hesitancy, however, would not only delay this ongoing pandemic but also even cause huge economic debts on the countries. **Aims and Objectives:** The objective of the study was to estimate the prevalence and to determine the reasons behind vaccine hesitancy among healthcare workers (HCWs) at ESIC Medical College and Hospital, Faridabad, Haryana. **Materials and Methods:** An institutional-based cross-sectional study was conducted among HCWs registered by government of India for COVID-19 vaccination at tertiary care center. Those who did not turn up on their day of appointment for vaccination were tracked and randomly selected for interview. Data were collected using semi structured questionnaire and was analyzed by Epi info 7.0. **Results:** A total of 759 HCWs out of 2029 registered at our center got vaccinated between the study periods. Mean age of participants was 28 years, including 64 (59.8%) men and 43 (40.2%) women. Most of the participants were doctors (31%) followed by medical students. Prevalence of vaccine hesitancy during study period was found to be 62.6%. The most common reason cited by participants for vaccine hesitancy was concern regarding safety and efficacy of COVID-19 vaccine. Multiple factors, including sex, designation, and co-morbidities and whether involved in the direct care of COVID-19 patient, were found to have influence on vaccine hesitancy. **Conclusion:** High prevalence of vaccine hesitancy as found in the present study is an alarming sign for a successful vaccination campaign. Developing tailored strategies to address concerns identified in the study are pivotal to decrease vaccine hesitancy among HCWs and thereby in the general population.

Key words: Coronavirus disease 2019; Healthcare workers; Vaccine hesitancy

INTRODUCTION

Vaccination is one of the most effective approaches for prevention and control of infectious disease in public health; it is reason for the eradication of smallpox and the control of many infectious diseases in many parts of the world. However, vaccine hesitancy is the term used to describe: “delay in acceptance or refusal of vaccination despite availability of vaccination services.”¹

Complacency, convenience and confidence are the factors that affect the attitude toward acceptance of vaccination as suggested by Strategic Advisory Group of Experts on Immunization,² where Complacency denotes the low perception of the disease risk; hence, vaccination seems unimportant. Confidence refers to low trust in vaccination safety, effectiveness, and competence of the health-care systems. Convenience entails the availability, affordability, and comfortable delivery of vaccines.³

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A newly emerged acute viral illness caused by SARS-Coronavirus-2, called as coronavirus disease 2019 or COVID-19 has soon proliferated into one of the deadly pandemic the mankind has ever faced. In India as a part of control measures against COVID-19, two vaccines have been launched from January 16, 2021.⁴

In the first phase, healthcare workers (HCWs) including medical students are targeted subsequently, in its second phase COVID-19 vaccination has been extended to those aged more than 60 years and those with co-morbidities from 45 to 59 years of age.⁵ The registration for the vaccination is done through online system on COVID-19 Vaccine Intelligence Network (CO-WIN) portal which is developed by Government of India. It also configured to track enlisted beneficiaries, issue SMS reminders, and vaccination certificates for users.⁶

Even though the initial studies done on acceptance of COVID-19 vaccine showed as high as 80% of the study population willing to take COVID-19 vaccine as soon as it become available for use⁷ but even many days after its launch the program has not picked up the speed as expected.

The concept of “vaccine hesitancy” has been considered by the World Health Organization as “one of the top-ten threats to global health.”⁸ The level of vaccine hesitancy observed among general population is directly proportional to Vaccine hesitancy in HCWs.⁹

Therefore, it becomes more important to know the prevalence and reasons of vaccine hesitancy in our medical college among HCWs and to address them as early as possible so that it does not affect the prescription of their future patients.

Aims and objectives

The objectives are as follows:

1. To estimate the prevalence of vaccine hesitancy among HCWs at ESIC Medical College and Hospital, Faridabad
2. To determine the reasons behind vaccine hesitancy among HCWs at ESIC Medical College and Hospital, Faridabad.

MATERIALS AND METHODS

This was a hospital-based cross-sectional study using a semi-structured questionnaire at ESIC Medical College and Hospital, Faridabad. The Government of India before rolling out the vaccination drive registered all the HCWs working all over the country with their contact and identification numbers. The doses in the first phase

of vaccination were available only for registered HCW's, which started on January 16, 2021. Every health care facility was allotted vaccine vials for calculated number of HCW's. All HCW's received text messages on their mobile phones before their appointed day of vaccination. The HCW's who did not turn up for vaccination kept on receiving the messages till the first phase of vaccination ended, that is, end of February 2021. The prevalence of vaccine hesitancy was calculated using the data registered on the portal created for vaccine registry. The number of HCW's who were sent messages for vaccination was sought and those who turned up for the same was also noted. Already enrolled HCW's in CO-WIN app for COVID-19 vaccine who did not turn up on their day of vaccination were interviewed.

Sample size

Taking prevalence of vaccine hesitancy to be 11.7%,¹⁰ from the previous literature, absolute precision of 5%, the total enrolled candidates for vaccine from the study setting as 2029 and confidence limit as 5% the minimum sample size calculated by open Epi software was 147.

Inclusion and exclusion criteria

All health workers registered in CO-WIN App through ESIC Medical College Faridabad were included in the study whereas pregnant/lactating mothers and HCWs who are on immune suppressant drugs were excluded from the study.

Ethical consideration

The study has been approved by the Institutional Ethics Committee of ESIC Medical College and Hospital, Faridabad, Haryana, India (No. 134/A/11/16/Academics/MC/2016/183). Informed consent in writing was taken from respondents who participated through physical interview.

Study tool and data collection

A list is generated by CO-WIN APP software one day before vaccination day that enlist number of candidates to be vaccinated. The list contains candidates name, age, phone number, and ID number. At the vaccination site data are maintained for all those candidates who have come for vaccination. In our study, we collected the names of those candidates who did not turn up for the vaccination; we called them and took appointment for interviewing them after their consent at their convenient time. A semi-structured questionnaire was used for quantitative data collection that was validated by group of experts from the department of community medicine. The study tool was first pilot tested on 10% of the individuals.

Study variables

1. Complacency related hesitancy - denotes to the low perception of the disease risk; hence, vaccination was deemed unnecessary

2. Vaccine risk related hesitancy - refers to the trust in vaccination safety, effectiveness
3. System related hesitancy - Mistrust on the competence of the public health authorities or healthcare systems
4. Convenience - entails the availability, affordability and delivery of vaccines in a comfortable context
5. Prevalence of vaccine hesitancy = (Total number of HCW's enrolled for vaccination - Total number of health workers who got vaccinated between January 25 and February 24, 2021), divided by total number of HCWs that have been enrolled for vaccination during the same period.

Data and statistical analysis

The quantitative data will be entered in Microsoft excel sheet and analyzed using Epi info version 7. The categorical variables will be presented using proportions. Chi-square will be applied to test the difference between variables. The significance level is set at 5%.

RESULTS

Out of the total number of HCWs enrolled in CO-WIN app (2029) only 759 turned up for vaccination between January 25 and February 24, 2021. The prevalence of vaccine hesitancy during this period was found to be 62.6% (2029-759/2029).

From the total of 1270 unvaccinated HCW's, 147 were approached for data collection. Of this 20 refused to give consent to participate, 17 returned questionnaires with missing information, ten refused to return the questionnaire after completing and withdrew their consent and 107 HCWs participated and completed the questionnaire. This included 64 (59.8%) men and 43 (40.2%) women. Most participants were between 18 and 25 years of age (57%); the average age was 28 years. Most of the participants were doctors (31%), followed by medical students. Majority of the participants did not have any comorbidities (87.9%) and most of them (61.7%) did not suffer from COVID19 in the past (Table 1).

Concern regarding safety and efficacy of COVID-19 vaccine were the most common reason cited by those hesitant to take the vaccine. Convenience related hesitancy; quoting that since it is not mandatory to take vaccine so can be skipped was the other major reason cited by participants. Majority (46.7%) believed that herd immunity had already developed in the community so no vaccination is required (Table 2). Complacency related hesitancy that denotes low perception of disease risk and mistrust on government/public health authorities were not the major reasons of vaccine hesitancy as cited by participants

(Figure 1). Few participants shared their personal views on vaccine hesitancy apart from the reasons mentioned in questionnaire (Figure 2).

Table 3 shows association between the four domains of vaccine hesitancy with socio demographic profile. HCWs with comorbidities had statistically significant association with complacency related vaccine hesitancy. No association was observed between convenience related vaccine hesitancy and socio demographic profile of participants. The study also observed that significant association was found between designation and vaccine risk related hesitancy. Clerical and housekeeping staff found to be more hesitant to take vaccine against COVID-19 whereas pharmacist being the least. Significant association between system related vaccine hesitancy and male gender, clerical staff, and medical students was found. HCWs who were not involved in the direct care of COVID patients were more reluctant to get vaccinated as shown in Table 3.

DISCUSSION

Vaccine hesitancy is an impending threat in the battle against COVID-19 as achieving herd immunity will not

Table 1: Socio demographic characteristics of healthcare workers' (n=107)

Characteristics	Frequency (%)
Sex	
Male	64 (59.8)
Female	43 (40.2)
Age	
18–25 years	61 (57)
26–40 years	34 (31.8)
>40 years	12 (11.2)
Education status	
Secondary	5 (4.7)
Higher secondary	4 (3.7)
Under graduate student	26 (24.3)
Undergraduate	56 (52.3)
Postgraduate	16 (15.0)
Designation	
Housekeeping	7 (6.5)
Clerical	19 (17.8)
Nursing	13 (12.1)
Pharmacist	5 (4.7)
Student	30 (28.0)
Doctor	33 (30.8)
Had COVID-19 infection in the past?	
Yes	41 (38.3)
No	66 (61.7)
Were involved in the direct care of COVID-19 patients?	
Yes	43 (40.2)
No	64 (59.8)
Preexisting comorbidities	
Nil	94 (87.9)
Yes	13 (12.1)

COVID-19: Coronavirus disease 2019

Table 2: Survey responses of reasons behind COVID-19 vaccine hesitancy among healthcare workers (n=107)

Factors of vaccine hesitancy related to complacency	Agreed (%)	Not agreed (%)
Since number of COVID cases has been reduced, there is no need for vaccination	39 (36.4)	68 (63.6)
I don't require vaccine as I acquired COVID in the past	22 (20.6)	85 (79.4)
I believe herd immunity has already developed in the community and hence vaccine is not required	50 (46.7)	36 (33.6)
	Don't know 21 (19.6)	
Factors of vaccine hesitancy related to convenience		
Feel publicity of COVID-19 vaccine is inadequate	33 (30.8)	74 (69.2)
I have not received any message through COWIN app. So I have lost faith in the campaign	17 (15.9)	90 (84.1)
Do not want to take the available vaccine and waiting for other vaccine brands to become available	38 (35.5)	69 (64.5)
Since it is not mandatory, I can skip	64 (59.8)	43 (40.2)
Factors of vaccine hesitancy related to Vaccine risk		
Worried about the side effects of COVID vaccine	85 (79.4)	22 (20.6)
Not sure of the effectiveness (benefit) of COVID vaccine	80 (74.8)	27 (25.2)
Worried about adverse effects of vaccine on my pre-existing comorbidities	29 (27.1)	78 (72.9)
Don't believe that vaccine will work for a longer period	61 (57.0)	46 (43.0)
COVID-19 vaccine hesitancy is the same as hesitancy for other vaccines in general	25 (23.4)	82 (76.6)
Factors of vaccine hesitancy related to mistrust on public health authorities (system)		
Vaccine should be first tested on others, and then I shall take	49 (45.8)	58 (54.2)
Feel publicity of COVID-19 vaccine is inadequate	33 (30.8)	74 (69.2)
Sceptical about government giving COVID vaccine free of cost	20 (18.7)	87 (81.3)
Feel that govt. has approved COVID-19 vaccines without following due procedures	39 (36.4)	66 (61.7)

COVID-19: Coronavirus disease 2019, CO-WIN: COVID-19 vaccine intelligence network

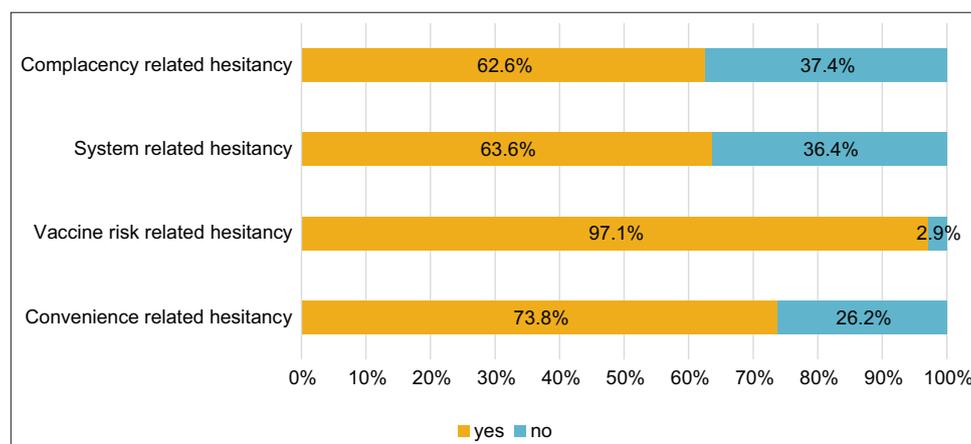


Figure 1: Domain wise factors affecting vaccine hesitancy

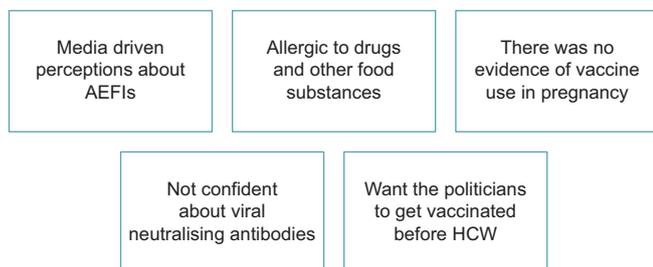


Figure 2: Personal views on vaccine hesitancy

only depend on the efficacy of the vaccine itself but also on the population's willingness to accept it.¹¹ In our study, prevalence of vaccination hesitancy during the period January 25, 2021–February 24, 2021, was found to be

62.6%. However, international data reveal that only 11.7% of population has vaccine hesitancy.¹⁰ The study done by Jain et al.,¹² among undergraduate medical students also shows 10.6% of the study population showing vaccine hesitancy. The huge difference in both studies may be due to time gap, as with the 2nd wave of COVID 19 infection that came in April 2021 there was much more acceptance to take vaccination or may also be due to methodology of the study as they were an online survey.

Before the launch of COVID-19 vaccine survey were done on almost 20,000 adults in 27 countries conducted in July and August 2020 showed that 74% of adults intended to receive COVID-19 vaccine when available, with the highest

Table 3: Domains of vaccine hesitancy with socio demographic and clinical profile of HCWs

Characteristics	Complacency related hesitancy	P-value	Convenience related hesitancy	P-value	Vaccine risk related Hesitancy	P-value	System related Hesitancy	P-value
	Yes (%)		Yes (%)		Yes (%)		Yes (%)	
Age group								
18–25 years	38 (62.3)	0.61	45 (73.8)	0.68	59 (96.7)	0.15	41 (67.2)	0.51
26–40 years	20 (58.8)		24 (70.6)		30 (88.2)		21 (61.8)	
>40 years	9 (75.0)		10 (83.3)		12 (100.0)		6 (50.0)	
Sex								
Male	43 (67.2)	0.3	49 (76.6)	0.5	60 (93.8)	1	47 (73.4)	0.014
Female	24 (55.8)		30 (69.8)		41 (95.3)		21 (48.8)	
Education								
Secondary	4 (80.0)	0.91	3 (60.0)	0.40	5 (100.0)	0.44	2 (40.0)	0.31
Higher secondary	3 (75.0)		4 (100.0)		4 (100.0)		3 (75.0)	
Under graduate student	16 (61.5)		19 (73.1)		26 (100.0)		20 (76.9)	
Undergraduate	34 (60.7)		39 (69.6)		52 (92.9)		35 (62.5)	
Postgraduate	10 (62.5)		14 (87.5)		14 (87.5)		8 (50.0)	
Designation								
Housekeeping	5 (71.4)	0.72	5 (71.4)	0.68	7 (100.0)	0.008	3 (42.9)	0.05
Clerical	14 (73.7)		15 (78.9)		19 (100.0)		15 (78.9)	
Nursing	7 (53.8)		8 (61.5)		11 (84.6)		6 (46.2)	
Pharmacist	4 (80.0)		5 (100.0)		3 (60.0)		2 (40.0)	
Student	17 (56.7)		22 (73.3)		29 (96.7)		24 (80.0)	
Doctor	20 (60.6)		24 (72.7)		32 (97.0)		18 (54.5)	
H/O COVID in past								
Yes	24 (58.5)	0.54	28 (68.3)	0.36	40 (97.6)	0.4	23 (56.1)	0.22
No	43 (65.2)		51 (77.3)		61 (92.4)		45 (68.2)	
Close contact with COVID pt								
Yes	41 (64.1)	0.83	48 (75.0)	0.82	62 (96.9)	0.21	40 (62.5)	0.84
No	26 (60.5)		31 (72.1)		39 (90.7)		28 (65.1)	
Direct care of COVID patients								
Yes	24 (55.8)	0.3	29 (67.4)	0.26	43 (93.0)	0.68	21 (48.8)	0.014
No	43 (67.2)		50 (78.1)		61 (95.3)		47 (73.4)	
Comorbidity								
Nil	63 (67.0)	0.016	72 (76.6)	0.098	88 (93.6)	1	61 (64.9)	0.54
Yes	4 (30.8)		7 (53.8)		13 (100.0)		7 (53.8)	

HCWs: Healthcare workers

rates in China (97%), Brazil (88%), Australia (88%), and India (87%) and the lowest in Russia (54%), Poland (56%), Hungary (56%), and France (59%).¹ Another study done in India showed that 79.5% of the study population was willing to take vaccine after its launch.⁷ With so much excitement to take vaccine before its launch, vaccine hesitancy prevalence as 62.6% as seen in the present study shows vaccine acceptance and demand are complex subjects that are context-specific and varying across community with time, place, and perceived behavior.¹³

In our study, concern regarding vaccine safety and efficacy were cited as the most common reasons for vaccine hesitancy. Similar results were found in the study done by Lin et al.,¹¹ where most commonly cited reasons for hesitation or refusal were fear of side effects, safety, and effectiveness. Lower acceptance for vaccine was observed among participants who believed that vaccines are unnecessary, have inadequate information, think that

vaccines have unknown/short duration of immunity, and have general anti-vaccine stand.

Study done by Palamenghi et al., shows that willingness to COVID-19 vaccine is correlated to trust in research and in vaccines, which decreased among the study participants from Phase 1 to Phase 2 of the Italian pandemic.¹⁴ Another study done by Lucia et al.,¹⁵ showed that medical students willing to take the vaccine were more likely to trust public health experts, had fewer concerns about side effects and agreed with vaccine mandates. In our study, however, system related vaccine hesitancy is associated with male gender, designation, and HCWs not involved in direct care of COVID 19 patients.

In our study, doctors and medical students were more hesitant toward all four categories of vaccine hesitancy as compared to the study done by Dror et al., in which they found nurses to be more vaccine resistant than physicians.¹⁶ The same

study also shows that healthcare providers not involved in the direct care of COVID-19 positive patients appeared to be less trustful of a COVID-19 vaccine than the general population; the similar trends are seen in our study too.

Murphy et al., studied the psychological characteristics associated with COVID-19 vaccine hesitancy that showed that COVID-19 vaccine hesitant persons were more self-interested, had distrust on scientists, health-care professionals and the state. They had strong religious, conspiratorial and paranoid beliefs. They were also more likely to believe that their lives are primarily under their own control, to have hierarchically structured and authoritarian preferred societies, and to be more intolerant of migrants in society. They were also more impulsive in their thinking style and had a disagreeable personality, emotionally unstable, and less conscientious.¹⁷ The psychological and behavioral aspect for deciding whether to take or not to take vaccine was not studied in the present study.

Apart from the above reasons for COVID-19 vaccine hesitancy, conspiracy theories that may arise due to political interference or religious belief added on by misleading media reporting can pose a dramatic effect.^{18,19}

The biggest concern of “vaccine hesitancy” is that the people who are unvaccinated could form a deadly reservoir of the coronavirus, which could cause further outbreaks of infection. Hence, it is imperative that a larger population (60–90%) is vaccinated so as to reach the level of adequate protection, equaling herd immunity.¹⁹

HCW play an influential role in their patients’ vaccination behavior. General public rely on them for all important scientific information so their consultation is a key factor in patients’ decision to be vaccinated or not.⁹ The higher prevalence of vaccine hesitancy as found in this study needs to be immediately addressed to avoid any chance of mass rejection of COVID-19 vaccine in the general population when a vaccine becomes available to them.

Limitations of the study

The cross-sectional nature of the study depicts a picture of the participant’s response at the given point of time. Further, simply looking at the ratio of people answering “Yes” or “No” does not tell the whole story. The study did not include psychological and other complex behavioral attributes for vaccine hesitancy. The study was conducted for a very short period of time so unable to comment on changing trends of vaccine hesitancy over the period of time.

CONCLUSION

High prevalence of vaccine hesitancy was found in the HCWs in the present study. Concern regarding safety and

efficacy of COVID-19 vaccine were the most common reason cited by those hesitant to take the vaccine. Multiple factors, including sex, designation, comorbidities, and whether involved in the direct care of COVID 19 patient, have influence on vaccine hesitancy. Developing strategies to address concerns identified in the study is pivotal to decrease vaccine hesitancy among HCWs and thereby in the general population.

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REFERENCES

1. Kwok KO, Li KK, Wei WI, Tang A, Wong SY and Lee SS. Editor’s choice: Influenza vaccine uptake, COVID-19 vaccination intention and vaccine hesitancy among nurses: A survey. *Int J Nurs Stud.* 2021;114:103854. <https://doi.org/10.1016/j.ijnurstu.2020.103854>
2. World Health Organization. Report of the Sage Working Group on. Geneva: World Health Organization; 2014. Available from: https://www.who.int/immunization/sage/meetings/2014/october/1_report_working_group_vaccine_hesitancy_final.pdf
3. Sallam M. COVID-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. *Vaccines (Basel).* 2021;9(2):160. <https://doi.org/10.3390/vaccines9020160>
4. Letter from AddlSecy MoHFW Reg Contraindications and Fact Sheet for COVID19 Vaccines. Available from: <https://www.mohfw.gov.in/pdf> [Last accessed on 6th June 2021]
5. Guidelines O. Operational Guidelines. Strategy; 2010. p. 1-66. Available from: <http://www.who.int/lep/resources/SEAGLP20062.pdf> [Last accessed on 5th June 2021]
6. Ministry of Health and Family Welfare Government of India. Citizen Registration and Appointment for Vaccination User Manual; 2021. p. 1-12. Available from: <https://www.mohfw.gov.in/pdf/usermanualcitizenregistration&appointmentforvaccination.pdf> [Last accessed on 5th June 2021]
7. Islam F, Agarwalla R, Panda M, Alvi Y, Singh V, Debroy A, et al. Assessment of the knowledge, preferences and concern regarding the prospective COVID-19 vaccine among adults residing in New Delhi, India a cross sectional study. *medRxiv.* 2021;10(6):2369-2375. <https://doi.org/10.1101/2021.01.23.21250164>
8. Khubchandani J, Sharma S, Price JH, Wiblehauser MJ, Sharma M and Webb FJ. COVID9 vaccination hesitancy in the United States: A rapid national assessment. *J Community Health.* 2021;46(2):270-277. <https://doi.org/10.1007/s10900-020-00958-x>
9. Nzaji MK, Ngombe LK, Mwamba GN, Ndala DB, Miema JM, Lungoyo CL, et al. Acceptability of vaccination against COVID-19 among healthcare workers in the democratic Republic of the Congo. *Pragmatic Obs Res.* 2020;11:103-109.

- <https://doi.org/10.2147/POR.S271096>
10. Freeman D, Loe BS, Chadwick A, Vaccari C, Waite F, Rosebrock L, et al. COVID-19 vaccine hesitancy in the UK: The Oxford coronavirus explanations, attitudes, and narratives survey (Oceans) II. *Psychol Med*. 2021;1-5.
<https://doi.org/10.1017/S0033291720005188>
 11. Lin C, Tu P and Beitsch LM. Confidence and receptivity for COVID-19 vaccines: A rapid systematic review. *Vaccines*. 2021;9(1):16.
<https://doi.org/10.3390/vaccines9010016>
 12. Jain J, Saurabh S, Kumar P, et al. COVID-19 vaccine hesitancy among medical students in India. *Epidemiol Infect*. 2021;149:e132. doi:10.1017/S0950268821001205
 13. Al-Mohaihtef M, Padhi BK. Determinants of COVID-19 Vaccine Acceptance in Saudi Arabia: A Web-Based National Survey. *J Multidiscip Healthc*. 2020;13:1657-1663. Published 2020 Nov 20. doi:10.2147/JMDH.S276771
 14. Palamenghi L, Barello S, Boccia S and Graffigna G. Mistrust in biomedical research and vaccine hesitancy: The forefront challenge in the battle against COVID-19 in Italy. *Eur J Epidemiol*. 2020;35(8):785-788.
<https://doi.org/10.1007/s10654-020-00675-8>
 15. Lucia VC, Kelekar A and Afonso NM. COVID-19 vaccine hesitancy among medical students. *J Public Health (Oxf)* 2020;43(3):445-449.
<https://doi.org/10.1093/pubmed/fdaa230>
 16. Dror AA, Eisenbach N, Taiber S, Morozov NG, Mizrahi M, Zigran A, et al. Vaccine hesitancy: The next challenge in the fight against COVID-19. *Eur J Epidemiol*. 2020;35(8):775-779.
<http://doi.org/10.1007/s10654-020-00671-y>
 17. Murphy J, Vallières F, Bentall RP, Shevlin M, McBride O, Hartman TK, et al. Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nat Commun*. 2021;12(29):1-15.
<http://doi.org/10.1038/s41467-020-20226-9>
 18. Khan YH, Mallhi TH, Alotaibi NH, Alzarea AI, Alanazi AS, Tanveer N, et al. Threat of COVID-19 vaccine hesitancy in Pakistan: The need for measures to neutralize misleading narratives. *Am J Trop Med Hyg*. 2020;103(2):603-604.
<https://doi.org/10.4269/ajtmh.20-0654>
 19. Iyengar KP, Vaishya R, Jain VK and Ish P. BAME community hesitancy in the UK for COVID-19 vaccine: Suggested solutions. *Postgrad Med J*. 2021;2021:139957.
<https://doi.org/10.1136/postgradmedj-2021-139957>

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