

COVID-19 vaccination: Is it a matter of concern?

Poonam Kushwaha¹, Ashish Pundhir², Anju Gahlot¹

¹Department of Community Medicine, Rama Medical College Hospital and Research Center, Mandhana, Kanpur, Uttar Pradesh, ²Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences Kalyani, West Bengal, India

ABSTRACT

Background: COVID-19 vaccination is still a matter of concern among the public since its inception. Primary care physicians being in prime position can share accurate and ample information about COVID-19 vaccination so we estimated proportion and determinants of adverse events following immunization (AEFI) with Covishield vaccine, vaccination and reasons of non-vaccination. **Methods:** A cross-sectional study was conducted from January to April 2021. Data collection was done by using data capture tool Epicollect-5. Regression analysis was performed to evaluate the association of AEFI and vaccine acceptance with various demographic variables. **Results:** Of 520 subjects, 408 got vaccinated, and of these 125 (30.6%) developed AEFI. Females without AEFI had lower median age than females having AEFI. Only religion (aOR = 5.311; 95%CI: 1.216–23.1) was significantly associated with AEFI. Education (aOR = 0.399; 95%CI: 0.199–0.799), marital status (aOR = 0.459; 95%CI: 0.245–0.858), and religion (aOR = 3.874; 95%CI: 1.96–7.648) were significantly associated with vaccination. Most common local AEFIs were inflammation (46; 36.8%) followed by lump (10; 8%) at the site of injection. Most common systemic AEFI were fever (87; 69.6%), feeling unwell (65; 52%), generalized weakness/fatigue (30; 20%), tiredness (26; 20.8%), flu-like symptoms (12; 9.6%), dizziness (10; 8%), headache (8; 6.4%) and gastrointestinal events (7; 5.6%). **Conclusion:** Most of the AEFI were mild and transient, resolved without any medical management. This study warrants active reporting of AEFI, public release of safety, and efficacy data. Primary care physicians can play a pivotal role by targeted awareness campaigns and trust-building activities to alleviate fear and anxiety related to vaccine.

Keywords: Adverse event following vaccination, COVID-19, India, nonacceptance, pandemic, vaccine hesitancy

Introduction

The origin of the outbreak of coronavirus disease 2019 (COVID-19) was initially detected in Wuhan, China in December 2019 and it spread rapidly around the globe. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a worldwide pandemic, which created catastrophic changes and unprecedented challenges to global public healthcare system leading to more than 267 million confirmed cases of COVID-19, including more than 5 million deaths, reported to WHO till date. COVID-19

vaccination coverage exceeds 8 billion globally and 132.93 crore nationally.^[1-3]

As the COVID-19 pandemic continued, we eagerly awaited the arrival of safe and effective vaccine. Vaccines showing early signs of promise and effectiveness, including two Indian-made vaccines (ChAdOx1 CoV-19 VACCINE: Covishield and Covaxin) that were granted emergency-use authorization.^[4-10]

COVID-19 vaccination is still a matter of concern among public since inception of vaccination drive, though it can be one of the most successful public health measures and achievements to protect us from changing the natural history of COVID-19 disease as witnessed in past 2 years, it is perceived as unsafe and unnecessary by a growing number of individuals. Lack of confidence and vaccine hesitancy is considered a threat to the success of vaccination

Address for correspondence: Dr. Poonam Kushwaha, 406, Staff-2 Accommodation, Rama Medical College Campus, Mandhana, Kanpur, Uttar Pradesh - 209217, India. E-mail: poonammaster21@gmail.com

Received: 06-09-2021

Revised: 14-12-2021

Accepted: 16-12-2021

Published: 30-06-2022

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_1778_21

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Kushwaha P, Pundhir A, Gahlot A. COVID-19 vaccination: Is it a matter of concern? J Family Med Prim Care 2022;11:2431-6.

programs and are believed to be responsible for low vaccination coverage.^[11-14] A sizeable amount of literature demonstrates that primary care physicians can play a crucial and vital role to decrease vaccine hesitancy, build public trust and confidence to promote COVID-19 vaccine uptake, and act as a resource person to ensure about the proper use of COVID-19 appropriate behavior.^[15-19]

Hence, the present study was conducted to estimate various “adverse events following COVID-19 vaccination” with Covishield vaccine, proportion of vaccination, reasons of nonvaccination, and their determinants to help the government in designing targeted awareness campaigns, public release of safety, and efficacy data of vaccine.

Methodology

Study subjects

This cross-sectional study was conducted among all employees including medical and paramedical personnel (doctors, nurses, and laboratory technicians), hospital administration, and others (clerks, sweeper, electrician, carpenter, attendants, etc.) working at a tertiary healthcare center at Rama Medical College Hospital and Research Centre, Kanpur from January to April 2021. All subjects above 18 years of age and willing to voluntarily participate were included in the study. Those who were unwilling, nonresponders, and absent on the day of the interview, left, or transferred from the institution were excluded. After taking verbal consent regarding voluntary participation, telephonic interview was conducted to gather information from all subjects.

Study tool

A semistructured, interviewer-administered questionnaire based on updated information about the COVID-19 vaccine (Covishield) ascertained by the “fact sheet for vaccine” provided by the Serum Institute of India Pvt. Ltd. was prepared.^[20] The questionnaire comprised the sociodemographic characteristics, AEFI after the first dose of vaccine, information regarding reasons of not being vaccinated, and vaccine hesitancy. Validity of the questionnaire was checked by feedback from selected experts. Based on their review, inappropriate and unrelated questions were either modified or removed. A pilot study was conducted among 30 subjects. The data of the pilot study were included in final analysis after applying necessary modifications. It was intended to approach as many subjects as possible to gather the maximum possible data to enhance the study’s validity and generalizability.

Sample size

Total of 750 subjects were enlisted, of those 117 (15.60%) subjects could not be contacted, 86 (11.47%) were nonresponders, 23 (3.07%) were transferred out/left the institution, and four (0.53%) were uncooperative. Finally, 520 (69.33%) subjects were interviewed telephonically and included in the analysis.

Data collection and statistical analysis

Data collection was done from a day after the first dose of the COVID-19 vaccine (*day 1*) till, subjects were asked questions

about short-term, solicited, local, and systemic reactions. Data collection was done by Epi-collect-5 (data capture tool) then Microsoft excel sheet was extracted and validated.^[21] Data were checked for consistency and completeness before entry. A clean database was generated and analyzed in SPSS-20.0. Distribution of the study population according to their sociodemographic profile was presented by frequency and percentage (%). Binary logistic regression analysis was conducted to test for plausible determinants of adverse events and vaccine acceptance. All *P* values < 0.05 with 95% confidence intervals (CIs) were considered significant. Linearity of continuous variable was assessed via the Box–Tidwell procedure with Bonferroni correction. Independent variables were not multicollinear as assessed by the correlation matrix. There was no significant outlier (only one case) or highly influential point as per case-wise diagnostic hence it was included in the analysis.

Ethics statement

Ethical approval was obtained from the Institutional Ethics Committee (Reference No. IEC/RMC/est./Dean/2021/12033). The subjects were explained about the nature of the study and verbal consent was taken. Anonymity and confidentiality of the given information were maintained. Health education and adequate counseling were provided.

Results

Sociodemographic profile

Overall, 520 subjects (mean age; 29.02 ± 8.71 years) were included in the final analysis with (271; 52.1%) females. Four-fifth were residing in urban areas. A total of 291 (56%) were unmarried, 193 (37.1%) were living alone, 322 (61.9%) were healthcare personnel, and 446 (85.8%) were educated above graduate or professional.

Determinants of adverse events following COVID-19 vaccination

Among all vaccinee ($n = 408$), 125 (30.6%) developed adverse events following COVID-19 vaccination. Overall, female subjects had lower median age than males. Female subjects without AEFI had lower median age than females having AEFI [Figure 1].

Binary logistic regression model was statistically significant by Hosmer and Lemeshow test and correctly classified 69.4% of cases. Increasing age was associated with an increased likelihood of adverse effects. Vaccinees educated above graduate, married, and living with family had 1.27-, 1.24-, and 1.55-times higher odds of adverse effect than those who were educated below graduate, unmarried, and living alone. All determinants were nonsignificantly associated with AEFI except religion (aOR = 5.311; [95%CI: 1.216–23.1]) [Table 1].

Solicited local AEFI, reported was inflammation (pain, swelling, redness, etc.) (46; 36.8%) followed by lump (10; 8%) at the injection site. Most common systemic adverse events observed

Table 1: Regression analysis of determinants of adverse events following vaccination

Sociodemographic variable	AEFI Present (n=125), (n %)	B	Unadjusted OR [95% CI]	Adjusted OR [95% CI]	P [‡]
Age	----	0.004	1.004 (0.980-1.029)	1.029 (0.991-1.068)	0.133
Sex					
Male	57 (30.5)	-0.025	reference	-	-
Female	68 (30.8)		0.987 (0.647-1.505)	0.976 (0.592-1.609)	0.923
Education					
Below Graduate	18 (37.5)	0.246	reference	-	-
Graduate/Professional	107 (29.7)		1.419 (0.758-2.655)	1.279 (0.585-2.796)	0.537
Marital status					
Married	53 (32.3)	0.217	reference	-	-
Unmarried	72 (29.5)		1.14 (0.744-1.749)	1.242 (0.66-2.337)	0.502
Family					
Living with family	85 (33.9)	0.441	reference	-	-
Living alone	40 (25.5)		1.498 (0.961-2.335)	1.554 (0.919-2.629)	0.100
Religion					
Hindu	123 (32)	1.670	reference	-	-
Other	2 (8.3)		5.184 (1.20-22.396)	5.311 (1.216-23.1)	0.026
Residence					
Urban	100 (30.2)	0.101	reference	-	-
Rural	25 (32.5)		0.900 (0.529-1.532)	0.734 (0.618-1.978)	0.734
Occupation					
Healthcare personnel*	74 (28.7)	-0.049	reference	-	-
Other [†]	51 (34.0)		0.781 (0.507-1.203)	0.952 (0.546-1.659)	0.862

* (Doctors and nursing staff), [†] (Management staff, Clerk, Sweeper, Guard, Electrician, Warden, Mess worker, etc.), [‡] (P<0.05 [significant]), OR: odds ratio

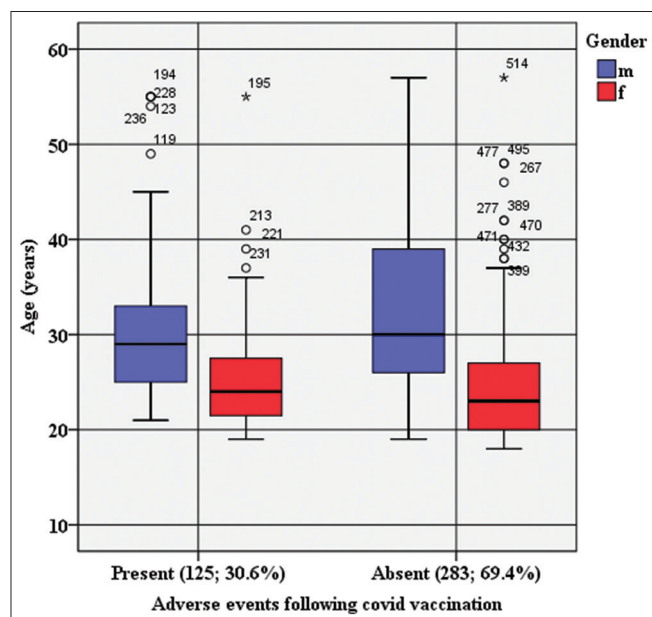


Figure 1: Association between age and AEFI stratified according to gender

was fever (87; 69.6%), feeling unwell (65; 52%), generalized weakness/fatigue (30; 20%), tiredness (26; 20.8%), flu-like symptoms (12; 9.6%), dizziness (10; 8%), headache (8; 6.4%), and gastrointestinal events (7; 5.6%). Most of the adverse events were mild-to-moderate intensity, resolved on their own without any medical assistance except in the cases (seven) of flu-like symptoms. Most of them were reported within 24 h of vaccination.

Reasons of nonvaccination

Out of 112 subjects, 22 (19.64%) did not get vaccinated because of contraindication, 14 (12.5%) were vaccine-hesitant, and 76 (67.84%) were attributed to other reasons like (45; 40%) being absent at session, being in night shift, busy, and family opposition. Most common reason for vaccine hesitancy ($n = 14$) was concern about safety and efficacy (9; 64.2%) followed by the perception of “let nature to take its own course” (4; 28.6%) and “COVID-19 is not dangerous to their health” (1; 1%).

Determinants of vaccination

Binary logistic regression model was statistically significant by Hosmer and Lemeshow test and correctly classified 78.5% of cases. Education (aOR = 0.399; 95%CI: 0.199–0.799), marital status (aOR = 0.459; 95%CI: 0.245–0.858), and religion (aOR = 3.874; 95%CI: 1.96–7.648) were significantly associated with vaccination. Those who belong to the Hindu religion and living alone had 3.87- and 1.07-times higher Odds of getting vaccinated than followers of other religions and those living with family, respectively [Table 2].

Discussion

The present study investigated various aspects associated with vaccination at the tertiary healthcare center, designated for the treatment of COVID-19 patients. Nearly 30% of the subjects had experienced AEFI. Incidence of AEFI reported in our study is more than reported in phase 1/2 clinical trial of this vaccine and study conducted among Armed Forces Medical Services healthcare workers (HCWs) deployed in northern India.^[10,22]

Table 2: Regression analysis of determinants of vaccination

Sociodemographic variable	Vaccination yes (n=408), (n, %)	B	Unadjusted OR [95% CI]	Adjusted OR [95% CI]	P [‡]
Age	----	-0.014	1.022 (0.999-1.046)	0.986 (0.953-1.02)	0.443
Sex					
Male	187 (75.1)	-0.395	reference	-	-
Female	221 (81.5)		0.682 (0.448-1.039)	0.674 (0.407-1.114)	0.124
Education					
Below Graduate	48 (64.9)	-0.920	reference	-	-
Graduate/Professional	360 (80.7)		0.441 (0.259-0.751)	0.399 (0.199-0.799)	0.010
Marital status					
Married	164 (71.6)	-0.780	reference	-	-
Unmarried	244 (83.8)		0.486 0.318-0.743)	0.459 (0.245-0.858)	0.015
Family					
Living with family	251 (76.8)	0.064	reference	-	-
Living alone	157 (81.3)		0.757 (0.486-1.180)	1.066 (0.608-1.870)	0.823
Religion					
Hindu	384 (80.5)	1.354	reference	-	-
Other	24 (55.8)		3.269 (1.718-6.218)	3.874 (1.96-7.648)	0.000
Residence					
Urban	331 (78.6)	-0.233	reference	-	-
Rural	77 (77.8)		1.051 (0.620-1.782)	0.792 (0.436-1.440)	0.445
Occupation					
Healthcare personnel*	258 (80.1)	-0.223	reference	-	-
Other [†]	150 (75.8)		1.290 (0.843-1.973)	0.800 (0.445-1.438)	0.456

* (Doctors and nursing staff), [†] (Management staff, Clerk, Sweeper, Guard, Electrician, Warden, Mess worker, etc.), [‡] (P<0.05 [significant]), OR: odds ratio

Although it is lesser than reported by Kamal *et al.*^[9] and Menni *et al.*,^[23] this variation could be because of different periods of follow-up.

Most of the adverse events were milder and resolved without any kind of medical supervision or management. No severe or serious AEFI was reported among the vaccinee. Most common adverse event observed was pain and lump at the injection site, fever, and generalized weakness. This supports the findings of the studies, wherein majority of recipients reported nonserious AEFI.^[9,10,24-26] Majority of adverse events were noted within the first 24–48 h of vaccination with a declining trend after this period simulating other studies.^[9] In our study, the incidence of AEFI was higher among females. These findings are consistent with the results of other studies.^[9,10,23,27,28]

Vaccine hesitancy is often complex and varies greatly across populations. The reason for vaccine hesitancy in this study was, let nature take its course, concerns about safety and efficacy, and do not think COVID-19 is dangerous to health. Other studies have also found that patients share comparable concerns regarding the safety profile, currently recognized and unforeseen side effects, and the development and approval process of COVID-19 vaccines.^[11,19,29,30]

Education, marital status, and religion were significantly associated with vaccine acceptance or hesitancy. A study done by Kwok *et al.*^[31] revealed that 63% were willing to be vaccinated and willingness was associated with younger age. Healthcare personnel primarily doctors had a positive attitude toward a COVID-19 vaccine as reported by Nzaji *et al.*^[32]

As patients are always comfortable to receive medical care from their local community physician, who can provide reliable and trustworthy information. They can ask the patients about their plan for getting vaccinated by empathizing with them about the beneficial effects of vaccination, sharing their own experiences after vaccination, and communicating the risk of not getting vaccinated in the changing scenario of disease. Hence, primary healthcare physician can provide health education by informing them about the benefits of vaccination, allay anxiety and myths associated with the vaccines, and information about AEFI, which will be mild and will resolve on its own, to increase the uptake of vaccine, and reduce hesitancy.^[32-34]

The institution where vaccination is being conducted should have both active as well as passive surveillance systems with community participation to monitor AEFI and further be reported to district health authorities for the purpose of necessitating any relevant intervention. Although local and systemic reactions are expected and are often mild and transient, they may have the most immediate influence on patients' perceptions of the vaccination experience and, in turn, can affect vaccination drive and coverage.

Key findings

Most of the AEFI were transient and milder, observed in the first 24 h predominantly with decreasing incidence in subsequent weeks after both the doses. No serious AEFI was observed. Findings of this study reveal that the vaccine is safe and well-tolerated with lower reactogenicity.

There is paucity of similar published studies in the public domain. All the subjects received two doses of vaccines and we studied adverse events for 4 weeks from each dose. Hence, we could report all the possible AEFI precisely. We contacted the subjects thrice so that probability of dropout and underreporting can be reduced. The authenticity and accuracy of reporting the AEFI were better as the study was conducted exclusively in healthcare center workers who could be assessed easily and precisely report the adverse events to the researcher. Like about four to five subjects called back, to report AEFI or to enquire about the second dose schedule.

This cross-sectional study design cannot establish causal inferences. Moreover, the small sample size and the institutional setting are only representative of similar settings and could not be validated externally. Therefore, studies utilizing larger samples, more representative populations, and investigation on the possible “nonspecific effects” of vaccines and short- and long-term benefits could be performed with properly designed and long-lasting comparative studies or randomized controlled trials. Few adverse events could have been coincidental and not attributable to the vaccination directly.

Key message

Primary care physician should consider vaccinations as a major component of their practice. Vaccines for instance, not only protect the individual and their family, but the public's health at large. They can be the best source of information about disease, its changing scenario, and preventive measurements. They should teach other healthcare workers to practice and ensure COVID-19 appropriate behavior.

Acknowledgments

Dr. Lakshmi Singh (Resident) had participated in data collection.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Lin Y, Hu Z, Zhao Q, Alias H, Danaee M, Wong P. Understanding COVID-19 vaccine demand and hesitancy: A nationwide online survey in China. *PLoS Negl Trop Dis* 2020;14:e0008961.
- WHO Coronavirus (COVID-19) Dashboard. Geneva: World Health Organization. 2021. Available from: <https://covid19.who.int/>. [Last accessed on 2021 Dec].
- Ministry of Health and Family Welfare Government of India. Latest Updates. Available from: <https://www.mohfw.gov.in/>. [Last accessed 2021 Dec].
- Hwang W, Lei W, Katritsis NM, MacMahon M, Chapman K, Han N. Current and prospective computational approaches and challenges for developing COVID-19 vaccines. *Adv Drug Deliv Rev* 2021;172:249-74.
- Chakraborty S, Mallajosyula V, Tato CM, Tan GS, Wang TT. SARS-CoV-2 vaccines in advanced clinical trials: Where do we stand? *Adv Drug Deliv Rev* 2021;172:314-38.
- AstraZeneca COVID-19 vaccine : What you should know. 2021. Available from: <https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/astrazeneca.html>. [Last accessed on 2021 Jan].
- Serum Institute of India Pvt. Ltd. Coronavirus disease (COVID-19): Vaccines. Vol. 11344. 1995. Available from: https://www.seruminstitute.com/product_covishield.php. [Last accessed on 2021 Jan].
- Mundra A, Garg BS. Prospects of Vaccine against COVID-19. *Indian J Community Med* 2020;45:391-5.
- Kamal D, Thakur V, Nath N, Malhotra T, Gupta A, Batlish R. Adverse events following ChAdOx1 nCoV-19 Vaccine (COVISHIELD) amongst health care workers: A prospective observational study. *Med J Armed Forces India* 2021;77:S283-8.
- Joshi RK, Muralidharan CG, Gulati DS, Dev JK, Kuthe S, Rather AA, *et al.* Higher incidence of reported adverse events following immunisation (AEFI) after first dose of COVID-19 vaccine among previously infected health care workers. *Med J Armed Forces India* 2021;77:S505-7.
- Talmy T, Cohen B, Nitzan I, Ben Michael Y. Primary care interventions to address COVID-19 vaccine hesitancy among Israel defense forces soldiers. *J Community Health* 2021;46:1155-60.
- Chen W, Chen W. Promise and challenges in the development of COVID-19 vaccines. *Hum Vaccin Immunother* 2020;16:2604-8.
- Frederiksen LSF, Zhang Y, Foged C, Thakur A. The long road toward COVID-19 herd immunity : Vaccine platform technologies and mass immunization strategies. *Front Immunol* 2020;11:1-26.
- Neumann S, Nirosha B, Varghese E, Sabat I, Pita P, Werner B. Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *Eur J Health Econ* 2020;21:977-82.
- Dubé E, Laberge C, Guay M, Bramadat P, Roy R, Bettinger JA. Vaccine hesitancy. *Hum Vaccin Immunother* 2013;9:1763-73.
- The SAGE Vaccine Hesitancy Working Group. What Influences Vaccine Acceptance: A Model of Determinants of Vaccine Hesitancy. World Health Organization; 2013. p. 1-5. Available from: https://www.who.int/immunization/sage/meetings/2013/april/1_Model_analyze_driversofvaccineConfidence_22_March.pdf. [Last accessed on 2021 Jan].
- Rhodes A, Hoq M, Measey M-A, Danchin M. Intention to vaccinate against COVID-19 in Australia. *Lancet Infect Dis* 2020;3099:30724-6.
- Poon PKM, Zhou W, Chan DCC, Kwok KO, Wong SYS. Recommending COVID-19 vaccines to patients: Practice and concerns of frontline family doctors. *Vaccines* 2021;9:1-11.
- Day P, Strenth C, Kale N, Schneider FD, Arnold EM. Perspectives of primary care physicians on acceptance and barriers to COVID-19 vaccination. *Fam Med Community Health* 2021;9:e001228. doi:10.1136/fmch-2021-001228.
- Serum Institute of India Pvt. Ltd. Fact sheet for vaccine recipient approved for restricted use in emergency

- situation of ChAdOx1ChAdOx1 nCoV- 19 Corona Virus Vaccine (Recombinant), 2021. Available from https://www.seruminstitute.com/pdf/covishield_fact_sheet.pdf. [Last accessed on 2021 Jan].
21. Center for Genomic Pathogen Surveillance. Epicollect5-Free and easy-to-use mobile data-gathering platform. [Internet] 2021. Available from: <https://five.epicollect.net/>.
 22. Folegatti PM, Ewer KJ, Aley PK, Angus B, Becker S, Belij-Rammerstorfer S, *et al.* Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: A preliminary report of a phase 1/2, single-blind, randomised controlled trial. *Lancet* 2020;396:467-78.
 23. Menni C, Klaser K, May A, Polidori L, Capdevila J, Louca P, *et al.* Vaccine side-effects and SARS-CoV-2 infection after vaccination in users of the COVID symptom study app in the UK: A prospective observational study. *Lancet Infect Dis* 2021;21:939-49.
 24. Ramasamy MN, Minassian AM, Ewer KJ, Flaxman AL, Folegatti PM, Owens DR, *et al.* Safety and immunogenicity of ChAdOx1 nCoV-19 vaccine administered in a prime-boost regimen in young and old adults (COV002): A single-blind, randomized, controlled, phase 2/3 trial. *Lancet* 2021;396:1979-93.
 25. Kaur RJ, Dutta S, Bhardwaj P, Charan J, Dhingra S, Mitra P, *et al.* Adverse events reported from COVID-19 vaccine trials: A systematic review. *Indian J Clin Biochem* 2021;36:1-13.
 26. Chapin-Bardales J. Reactogenicity following receipt of mRNA-based COVID-19 vaccines. *JAMA* 2021;325:2201-2.
 27. Gee J, Marquez P, Su J, Calvert GM, Liu R, Myers T, *et al.* First month of COVID-19 vaccine safety monitoring - United States, December 14, 2020-January 13, 2021. *MMWR Morb Mortal Wkly Rep* 2021;70:283-8.
 28. Jayadevan R, Shenoy R, Anithadevi TS. Survey of symptoms following COVID-19 vaccination in India. *medRxiv* 2021. doi.org/10.1101/2021.02.08.21251366.
 29. Paul E, Steptoe A, Fancourt D. Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications. *Lancet Reg Health Eur* 2020;1:100012.
 30. Grech V. Vaccine hesitancy among Maltese healthcare workers toward influenza and novel COVID-19 vaccination. *Early Hum Dev* 2020:105213. doi: 10.1016/j.earlhumdev.2020.105213.
 31. Kwok KO, Li K-K, WEI WI, Tang A, Wong SYS, Lee SS. Influenza vaccine uptake, COVID-19 vaccination intention and vaccine hesitancy among nurses: A survey. *Int J Nurs Stud* 2021;114:1-10.
 32. Nzaji MK, Ngombe LK, Mwamba GN, Miema JM, Lungoyo CL, Mwimba BL. Acceptability of vaccination against COVID-19 among healthcare workers in the Democratic Republic of the Congo. *Pragmatic Obs Res* 2020;11:103-9.
 33. Katzman JG, Katzman JW. Primary care clinicians as COVID-19 vaccine ambassadors. *J Prim Care Community Health* 2021;12:1-4.
 34. Head KJ, Kasting ML, Sturm LA, Hartsock JA, Zimet GD. A national survey assessing SARS-CoV-2 vaccination intentions: Implications for future public health communication efforts. *Sci Commun* 2020;42:698-723.