

Attitude and Behavior of Healthcare Workers and General Public Towards SARS-CoV-2 Vaccination After the Rollout of COVID-19 Vaccines

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ABSTRACT

Background: Comparative studies have been reported on the uptake of the COVID-19 vaccination among healthcare workers (HCWs) and the general public (GP) before the rollout of the vaccination programs.

Objective: This study aimed to compare the uptake of vaccination among HCWs and GP, and their attitude and behavior towards SARS-CoV-2 vaccination after the rollout of the vaccination program in Pakistan.

Methodology: This cross-sectional survey was conducted in Hayatabad Medical Complex, Peshawar, Pakistan from 6th to 26th December 2021. A trained researcher approached HCWs and GP in person and interviewed them using a piloted questionnaire. Demographic data and responses (yes/no) to the following questions were recorded; vaccination status, motivating factors for vaccination in vaccinated participants and whether they delayed their vaccination, plan to get the vaccine in the unvaccinated participants, and concerns regarding vaccination in all participants.

Results: A total of 307 HCWs and 344 participants from GP took part in the survey. A higher proportion of HCWs than GP were vaccinated (84.7% vs 74.4%, $p < 0.001$). A smaller number (57.7% vs 81%, $p < 0.001$) of females were vaccinated in the GP group than HCWs. A considerable number of participants with concerns like the vaccine contains a microchip, religious concerns, and deeming vaccine unnecessary after natural infection belonged to the GP group (78.9% $p = 0.021$, 81.5%, $p = 0.002$ and 67%, $p = 0.002$, respectively). Motivating factors like Institutional requirement and mandatory vaccination for travelling abroad were reported by higher number of GP (59.8%, $p = 0.006$ and 68.1%, $p = 0.008$, respectively). A significant proportion of HCWs (63.8%, $p < 0.001$) than GP got vaccinated because of their knowledge about COVID-19.

Conclusions: Healthcare workers had a higher vaccination rate compared to GP. Vaccine related concerns regarding clotting and financial scam were reported more by HCWs. While vaccines to install microchip, religious misconceptions and redundancy of vaccination after natural infection were reported more by GP. Institutional requirement and travelling abroad were the main driving factors for the GP to get vaccinated while for HCWs, it was awareness about the sequelae of contracting COVID-19.

Keywords: COVID-19; SARS-CoV-2; Vaccination; Attitude; Pakistan

Introduction

Since the onset of its outbreak in December 2019, 399,600,607 cases of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) have been reported globally, resulting in 5,757,562 deaths.¹ As of February 10, 2022, Pakistan has reported 1,474,075 cases and 29,648 deaths due to SARS-CoV-2.² For a disease with no specific antiviral therapy, an effective, safe & cheap vaccine was the only hope to end the pandemic. On December 2, 2020, the United Kingdom was the first country to approve the Pfizer BioNTech vaccine for SARS-CoV-2. Soon it was approved by Food and Drug Authority (FDA), World Health Organization (WHO) & other regulatory authorities across the globe.³ This was followed by the approval of other vaccines against SARS-CoV-2. All the approved vaccines are highly effective & safe.⁴ Fake news and negative propaganda about SARS-CoV-2 and its vaccination were promoted on print, electronic and social media. Rumors like hidden monitoring microchips, remote control of our behavior by the West, losing manhood, infertility issues, etc. were propagated on social media.⁵ These provided a fertile ground for changing the attitude and behavior of HCWs and GP towards SARS-CoV-2 vaccination.

Healthcare workers are at a higher risk of contracting SARS-CoV-2 infection.⁶ Being at the interface of patients and society, HCWs are potential sources to spread and perpetuate the pandemic. Patients visiting healthcare facilities are usually elderly, frail & have comorbid conditions. They are vulnerable to contracting the illness from infected HCWs with the worst outcome. Vaccinating HCWs against SARS-CoV-2 is not only important to protect them against severe disease and death, but it also prevents transmission of infection from HCWs to their patients. Vaccinating HCWs ensures the smooth running of the healthcare system amidst the pandemic. Due to these reasons, HCWs were the priority to be vaccinated. It has been reported that despite knowing about the disease, the coverage for recommended vaccination among HCWs is generally low.⁷ Only 27% of HCWs in Africa are vaccinated against SARS-CoV-2.⁸ National Health Service England mandated compulsory vaccination against COVID-19 for HCWs, and those who are not vaccinated would be dismissed from their job by April 1, 2022.⁹ Instead of being a strong advocate for SARS-CoV-2 vaccination and a role model for the GP, some HCWs protested compulsory vaccination.¹⁰

Overall, 61.1% of the world population and 10.6% of people in low-income countries have received at least one dose of the COVID-19 vaccine. Moreover, as of February 11, 2022, 39 % of the Pakistani population is fully vaccinated.^{11,12} Surveys comparing the attitude and behavior of HCWs and GP towards COVID-19 vaccination

have been reported.^{13,16} These surveys were conducted before the rollout of COVID-19 vaccination program in Pakistan. Most of them were designed to explore the intentions of the study participants. On February 2, 2021, the government of Pakistan rolled out COVID-19 vaccination by providing a variety of approved vaccines free of cost to eligible citizens.¹⁷ Healthcare workers were the priority group to be vaccinated. We got curious whether the actual availability of free, effective, and approved vaccines would have changed the attitude and behavior of HCWs and GP. This led us to design this study to compare the uptake of vaccination among HCWs and GP, and their attitude and behavior towards SARS-CoV-2 vaccination after the rollout of the vaccination program in Pakistan.

Methodology

This study was conducted in Medical Teaching Institute / Hayatabad Medical Complex, Peshawar, Pakistan after approval by the institutional review board of Khyber Girls Medical College, Peshawar, Pakistan on 26th November 2021. It was a cross-sectional survey. A researcher-administered questionnaire was approved after pilot testing in 50 HCWs and 50 persons from GP. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline is used to report the study findings.

The survey was conducted from 6th to 26th December 2021. Healthcare workers (doctors, nurses, and support staff working in Hayatabad Medical Complex) and GP were approached in person for the study. They were informed about the purpose of the study. A trained healthcare worker interviewed all those who consented to participate. Demographic data (age, gender, years of formal education and presence of comorbid conditions), and responses (yes/no) of the participants to the following questions were recorded on the questionnaire; vaccination status, motivating factors for vaccination in vaccinated participants and whether they delayed their vaccination, plan to get the vaccine in the unvaccinated participants, and concerns regarding vaccination in all participants.

Statistical Package for the Social Sciences, version 21 for Windows was used for data analysis. Mean and standard deviation were calculated for quantitative variables, and these were evaluated for normality by Shapiro-Wilk test. Frequencies and percentages were calculated for categorical variables. Mann-Whitney U test was used to compare differences in age and years of education between HCWs and GP. Differences in frequencies/percentages were calculated by chi-square test. A p-value of less than or equal to 0.05 was considered as significant for all analyses.

Results

A total of 307 HCWs and 344 participants from GP took part in the survey. There was male predominance (71.8%) in the GP group whereas HCWs were evenly distributed (53.1% male vs 46.9% female). General public group was older than HCWs group (39.2 ± 14.2 vs 29.9 ± 7.9 years, $p < 0.001$). A significantly higher proportion of HCWs than GP were vaccinated against SARS-CoV-2 (84.7% vs 74.4%, $p < 0.001$). The demographic parameters of both groups are summarized in Table 1.

Compared to the vaccinated participants, the mean age

of unvaccinated HCWs and GP were not significantly different; 30 ± 8.1 vs 29.1 ± 6.6 years, $p = 0.986$ and 39.1 ± 13.5 vs 39.5 ± 15.9 , $p = 0.778$, respectively. Similarly, the mean years of education of vaccinated and unvaccinated participants were comparable in HCWs (13.6 ± 5.3 vs 14.7 ± 4.4 , $p = 0.227$) and GP (7.1 ± 6.3 vs 6.9 ± 6.4 , $p = 0.901$). A significantly smaller proportion (57.7% vs 81%, $p < 0.001$) of females were vaccinated in GP group while both genders had comparable vaccination rates in the HCWs group. Presence of a comorbid condition did not affect the uptake of vaccination in either group. The findings are summarized in Table 2.

Table 1: Demographic parameters of study participants (n = 651)

	Healthcare Workers (n= 307)	General Public (n=344)	P value
Age, Mean \pm SD (years)	29.9 ± 7.9	39.2 ± 14.2	<0.001
Education, Mean \pm SD (years)	13.7 ± 5.1	7.1 ± 6.3	<0.001
Gender, No. (%)			
Male	163 (53.1%)	247 (71.8%)	<0.001
Female	144 (46.9%)	97 (28.2%)	
Designation, No. (%)			
Doctors	162 (52.8%)		
Nurses	81 (26.4%)		
Support staff	64 (20.8%)		
Comorbid conditions, No. (%)			
No comorbidity	282 (91.9%)	242 (70.3%)	<0.001
At least one comorbidity	25 (8.1%)	102 (29.7%)	
Vaccination status, No. (%)			
Vaccinated	260 (84.7%)	256 (74.4%)	0.001
Unvaccinated	47 (15.3%)	88 (25.6%)	

Table 2: Comparison of vaccinated and unvaccinated healthcare workers and general public

Variables		Healthcare Workers (n = 307)			General Population (n = 344)		
		Vaccinated	Unvaccinated	P -value	Vaccinated (n = 256)	Unvaccinated (n = 88)	P -value
Age, Mean \pm SD (years)		30 ± 8.1	29.1 ± 6.6	0.986	39.1 ± 13.5	39.5 ± 15.9	0.778
Years of education, Mean \pm SD (years)		13.6 ± 5.3	14.7 ± 4.4	0.227	7.1 ± 6.3	6.9 ± 6.4	0.901
Gender	Male	139 (85.3%)	24 (14.7%)	0.762	200 (81 %)	47 (19 %)	<0.001
	Female	121 (84 %)	23 (16 %)		56 (57.7 %)	41 (42.3 %)	
Comorbid Conditions	No comorbidity	239 (84.8 %)	43 (15.2 %)	0.920	186 (76.9 %)	56 (23.1%)	0.110
	At least one comorbidity	21 (84 %)	04 (16 %)		70 (68.6%)	32 (31.4%)	

A significant majority of participants who were concerned about vaccine related blood clotting and who considered the vaccine as a marketing strategy of the West belonged to the HCWs group (80.4 %, $p < 0.001$ and 73.7%, $p = 0.019$, respectively). Similarly, a considerable number of participants with concerns like the vaccine contains a microchip, religious concerns, and thoughts that the vaccine is not necessary after natural infection belonged to the GP group (78.9% $p = 0.021$, 81.5%, $p = 0.002$ and 67%, $p = 0.002$, respectively). (Figure 1) Motivating factors like institutional requirement to get vaccinated and mandatory vaccination for travelling abroad were reported by significantly higher number of GP (59.8%, $p = 0.006$ and 68.1%, $p = 0.008$, respectively). Statistically significant proportion of HCWs (63.8%, $p < 0.001$) than

GP got vaccinated because of their knowledge about COVID-19. (Figure 2)

Compared to GP, a significant majority of HCWs (97.1%, $p = 0.014$) who had concerns regarding blood clots due to the vaccine were vaccinated. Similarly, a significant proportion of HCWs, but not the GP, who thought they shall wait for availability of a better vaccine stayed unvaccinated (73.3%, $p < 0.001$). Unlike HCWs, a considerable proportion (59.1%, $p < 0.001$) of GP with concerns based on their religious beliefs remained unvaccinated. Despite the concern that the vaccine is not effective, a significant proportion of these participants from GP group were vaccinated (84.1%, $p = 0.016$). Table 3

Figure 1: Comparison of concerns and motivation for vaccination between healthcare workers and general public

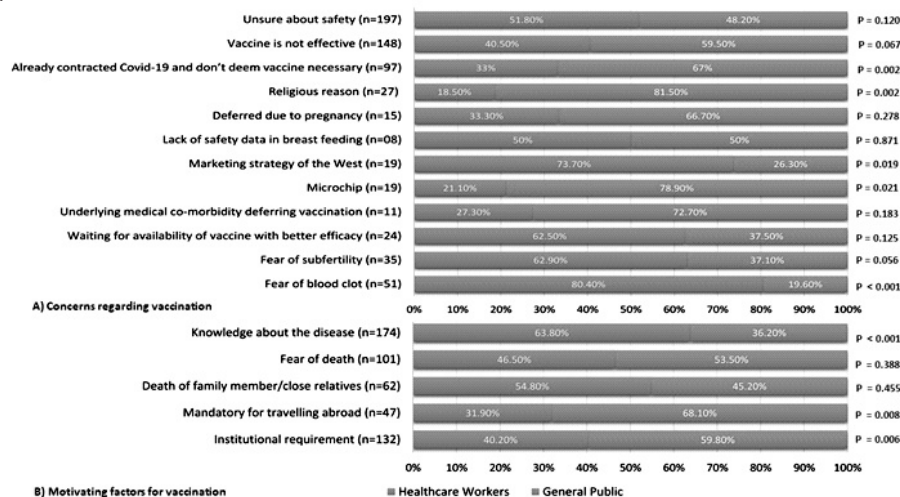


Table 3: Comparison of concerns regarding vaccination among vaccinated and unvaccinated healthcare workers and general public

Concerns	Healthcare Workers (n = 307)			General Population (n = 344)		
	Vaccinated	Unvaccinated	P value	Vaccinated	Unvaccinated	P value
Fear of blood clot	40 (97.6%)	01 (2.4%)	0.014	8 (80%)	02 (20%)	0.681
Fear of subfertility	20 (90.9%)	02 (9.1%)	0.401	10 (76.9%)	03 (23.1%)	0.833
Waiting for availability of vaccine with better efficacy	04 (26.7%)	11 (73.3%)	<0.001	08 (88.9%)	01 (11.1%)	0.313
Underlying medical co-morbidity deferring vaccination	03 (100%)	00	0.459	06 (75%)	02 (25%)	0.970
Microchip	04 (100%)	00	0.392	13 (86.7%)	02 (13.3%)	0.266
Marketing strategy of the West	13 (92.9%)	01 (7.1%)	0.385	04 (80%)	01 (20%)	0.773
Lack of safety data in breast feeding	04 (100%)	00	0.392	02 (50%)	02 (50%)	0.260
Deferred due to pregnancy	05 (100%)	00	0.338	05 (50%)	05 (50%)	0.072
Religious reason	05 (100%)	00	0.338	09 (40.9%)	13 (59.1%)	<0.001
Already contracted Covid-19 & don't deem vaccine necessary	25 (78.1%)	07 (21.9%)	0.276	45 (69.2%)	20 (30.8%)	0.287
Vaccine is not effective	53 (88.3%)	07 (11.7%)	0.382	74 (84.1%)	14 (15.9%)	0.016
Unsure about safety	84 (82.4%)	18 (17.6%)	0.422	72 (75.8%)	23 (24.2%)	0.719

Compared to the vaccinated HCWs, a significantly higher proportion of vaccinated GP delayed their vaccination (26.6% vs 16.5%, $p=0.006$). Unvaccinated participants in HCWs and GP group did not differ in their plans to get vaccinated (80.9% vs 77.3%, $p=0.630$)

Discussion

Despite the vital role vaccines have played in improving the public health over the last century, myths and misconceptions about the risks of vaccines continue to persist. These myths date back to the smallpox epidemic in England in the 18th century.¹⁸ The concerns about the efficacy and the adverse effects of vaccines have been the main reasons in the drive against vaccination. As more vaccines are introduced for public safety, more myths arise. The COVID – 19 vaccines are no exception rather the pick of all.¹⁹ The fluctuating attitude and motivation towards COVID-19 vaccination compelled us to explore and compare the responses of HCWs and GP.

Overall, the vaccination rate in HCWs compared to GP was higher (84.7% vs 74.4%, $p<0.001$). This finding is comparable to the study by Kashif et al. (53.8% vs. 28.6%, respectively).¹⁴ Female had a significantly low vaccination rate in GP (57.7% vs 81%, $p<0.001$) compared to HCWs in this study. This under vaccination could be due to the male-dominant Pashtun society, cultural constraints, and a lower female literacy rate in Pakistan. Lower acceptability of COVID-19 vaccines among female has been predicted before the roll out of vaccination in Bangladesh.¹⁵

In this study, more HCWs than GP had fears about the blood clotting side effects of COVID-19 vaccination. Elise Paul has also reported similar findings from London.¹⁶ This may be because HCWs are more knowledgeable about the side effects of drugs and vaccines. Despite being fearful of blood clots, the HCWs had a higher rate of COVID-19 vaccination. This higher vaccination rate in HCWs could be due to the fear of acquiring severe COVID-19 which can lead to death and disability.

There are reports of concerns about the efficacy, safety, and credibility of vaccines in GP.²⁰ A significant proportion of HCWs in our study expressed reluctance for vaccination due to concerns about their effectiveness and preferred to wait until a more efficacious and safe vaccine was introduced. It has been reported from the United States of America that 56% of HCWs opted to wait for more safety and efficacy data before they would get vaccinated.²¹

Religious beliefs play a significant role in favor or against vaccination. We found a statistically substantial difference between the HCWs and the GP regarding their willingness to go for vaccination based on religious

apprehensions. The GP were more hesitant to get vaccinated due to religious reasons than HCWs. Similar findings have been reported by Ramadan M. Elkalmi from Malaysia.²² In contrast to our findings, Abbas et al have reported that religious beliefs have no role in vaccine refusal in GP from Sindh province, Pakistan.¹³ This could be due to the difference in the study population as only 9.3% of participants were illiterate and the rest were well educated in the study from Sindh, Pakistan.

Conspiracy theories about COVID-19 vaccines as a tool for population control, fertility issues and microchip were trending on social media.³ The concern regarding microchip was more prevalent in the GP (78.9% vs 21.1%, $p=0.021$). Malik Sallam has also reported this from Jordan.²³

Vaccines against COVID-19 were considered to be one of the financial scams of the West to get economic profits, instead of being concerned with the health benefits of people of the developing countries.²⁴ To our surprise, more HCWs were in favor of declaring the COVID-19 vaccine as a financial scam and money-making strategy of pharmaceutical industries (73.7 % HCWs vs. 26.3% G.P. $p=0.019$). This has been reported by Sanjeeta Dara et al. from India as well.²⁵ This apprehension could be due to a higher educational level and more awareness among HCWs about the nexus between pharmaceutical industries and the regulatory authorities.

More participants from GP who had acquired COVID-19 in the past were not in favor of vaccination, believing they were now immune to COVID-19 (67% vs. 33%, $p=0.002$). Tahir MJ et al have reported similar finding in GP of Pakistan'.²⁶ In a study by Sanjeeta et al., HCWs considered natural immunity superior to vaccination.²⁵

A higher fraction of GP than HCWs got vaccinated because of employment requirements to continue their jobs (78.9% vs. 21.1%, $p=0.021$). This higher fraction of enforced vaccination augments the observation by Kashif et al.¹⁴ Significantly higher proportion of GP than HCWs got vaccinated to travel abroad (68.1% G.P. vs. 31.9% HCWs $p=0.008$). Similar finding has been reported from Poland by Bartosz Szmyd et al.⁷

There was no difference between the opinions of GP and HCWs to delay the vaccination till the availability of vaccine with better efficacy (62.5 vs. 37.5%, $p=0.125$). More HCWs (73.3%, $p<0.001$) preferred to wait for a more effective and safer COVID-19 vaccine. Healthcare workers preferred watchful waiting because they are more aware of efficacy and safety concerns than GP. A similar cautious approach was noted by Mahmud and Mohsin from Bangladesh.¹⁵

The main strength of the current study was that it was

conducted at a time when a variety of free, effective and approved vaccines were available to both HCWs and GP. It was not merely an assessment of the intention to get vaccinated. The same trained healthcare worker collected all the data. Female representation was less in the GP group. Due to single-center design of the study, and cultural, social and religious differences, the results of this study cannot be generalized.

Conclusion

Healthcare workers had a higher vaccination rate compared to GP. Vaccine related concerns regarding clotting and financial scam were reported more by HCWs. Vaccination as a tool to install microchip, religious misconceptions and redundancy of vaccination after natural infection were reported more by GP. Institutional requirement and travelling abroad were the main driving factors for the GP to get vaccinated while for HCWs, it was awareness about the sequelae of contracting COVID-19.

References

1. WHO. WHO Coronavirus (COVID-19) Dashboard. <https://covid19.who.int/> [accessed 02/10/2022]
2. COVID Portal Pakistan. <https://covid.gov.pk/> [accessed 02/10/2022]
3. Noor M. COVID-19 Pandemic From Pakistan Perspective. 2021. <https://kjms.com.pk/index.php/kjms/article/view/270>
4. World Health Organization. Coronavirus disease (COVID-19): Vaccines. 2022. [https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-\(covid-19\)-vaccines](https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-(covid-19)-vaccines) [accessed 02/18/2022]
5. van der Linden S, Roozenbeek J, Compton J. Inoculating Against Fake News About COVID-19. *Front. Psychol.* 2020. <https://www.frontiersin.org/article/10.3389/fpsyg.2020.566790>
6. Noor M, Haq M, Ul Haq N et al. Does Working in a COVID-19 Receiving Health Facility Influence Seroprevalence to SARS-CoV-2? 2020.
7. Szmyd B, Karuga FF, Bartoszek A et al. Attitude and Behaviors towards SARS-CoV-2 Vaccination among Healthcare Workers: A Cross-Sectional Study from Poland. 2021.
8. World Health Organization. Only 1 in 4 African health workers fully vaccinated against COVID-19. 2021. <https://www.afro.who.int/news/only-1-4-african-health-workers-fully-vaccinated-against-covid-19> [accessed 02/18/2022]
9. NHS. Vaccination as a Condition of Deployment (VCOD) for Healthcare Workers—Phase 1: planning and preparation. 2022. <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2022/01/C1545-update-vcod-for-healthcare-workers-phase-2-implementation.pdf>
10. Meierhans J. Call to delay compulsory Covid vaccines for NHS staff. 2022. <https://www.bbc.com/news/uk-60096735> [accessed 02/18/2022]
11. Coronavirus (COVID-19) Vaccinations. <https://ourworldindata.org/covid-vaccinations> [accessed 02/10/2022]
12. National Command and Operation Centre, Government of Pakistan. 2022. <https://twitter.com/OfficialNcoc/status/1492005813585653800?ext=HwW0MC5mb3Y1bQpAAAA> [accessed 02/11/2022]
13. Abbas Q, Mangrio F, Kumar S. Myths, beliefs, and conspiracies about {COVID}-19 Vaccines in Sindh, Pakistan: An online cross-sectional survey. *Authorea, Inc.*; 2021. <https://doi.org/10.22541%2Fau.161519250.03425961%2Fv1>
14. Kashif M, Fatima I, Ahmed AM et al. Perception, Willingness, Barriers, and Hesitancy Towards COVID-19 Vaccine in Pakistan: Comparison Between Healthcare Workers and General Population. 2021.
15. Mahmud S, Mohsin M, Khan IA, Mian AU, Zaman MA. Knowledge, beliefs, attitudes and perceived risk about COVID-19 vaccine and determinants of COVID-19 vaccine acceptance in Bangladesh. 2021.
16. Paul E, Steptoe A, Fancourt D. Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications. 2021. <https://www.sciencedirect.com/science/article/pii/S2666776220300120>
17. Junaidi I. Pakistan begins vaccine roll-out. 2021. <https://www.dawn.com/news/1605205> [accessed 02/18/2022]
18. Boylston A. The origins of vaccination: myths and reality. 2013.
19. Ullah I, Khan KS, Tahir MJ, Ahmed A, Harapan H. Myths and conspiracy theories on vaccines and COVID-19: Potential effect on global vaccine refusals. 2021.
20. Yahaghi R, Ahmadizade S, Fotuhi R et al. Fear of COVID-19 and Perceived COVID-19 Infectability Supplement Theory of Planned Behavior to Explain Iranians' Intention to Get COVID-19 Vaccinated. *Vaccines*. 2021.

21. Shekhar R, Sheikh AB, Upadhyay S et al. COVID-19 Vaccine Acceptance among Health Care Workers in the United States. *Vaccines* . 2021.
22. Elkalmi RM, Dyab E, Mohd Suhaimi A et al. Attitude, Familiarity and Religious Beliefs about Vaccination among Health Science and Non-Health Science Students in a Malaysian Public University. *Eur. J. Investig. Heal. Psychol. Educ.* . 2021.
23. Sallam M, Dababseh D, Eid H et al. Low COVID-19 Vaccine Acceptance Is Correlated with Conspiracy Beliefs among University Students in Jordan. 2021.
24. Sadaqat W, Habib S, Tauseef A et al. Determination of COVID-19 Vaccine Hesitancy Among University Students. 2021.
25. Dara S, Sharma SK, Kumar A et al. Awareness, Attitude, and Acceptability of Healthcare Workers About COVID-19 Vaccination in Western India. 2021.
26. Tahir MJ, Saqlain M, Tariq W et al. Population preferences and attitudes towards COVID-19 vaccination: a cross-sectional study from Pakistan. 2021. <https://doi.org/10.1186/s12889-021-11814-5>