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## Original article

# Assessment of attitude and hesitancy toward vaccine against COVID-19 in a Pakistani population: A mix methods survey



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## ABSTRACT

**Objective:** The objective of this study was to assess the attitude and hesitancy toward vaccine against COVID-19 in a Pakistani Population.

**Materials and methods:** A mix-method, prospective study was conducted and adults (aged  $\geq 18$  years) residing in Pakistan were invited to participate. The questionnaire was prepared, hosted in Google Forms and circulated through electronic platforms and was also available to be done in in-person. Data was compiled from 15th September to 30th November 2020.

**Results:** The response rate was 80%. A total of 1003 participants were included in the final analysis. Of them, 75% completed survey questionnaire online, while remaining 25% responded in-person. The mean age of the participants was  $29.62 \pm 10.47$  years. The majority of participants were females; 60.9% ( $n=611$ ). 57.02% ( $n=572$ ) of the participants were employed at the time of survey. Overall, 70.68% ( $n=709$ ) of the participants had previous experience of vaccines such as the flu vaccine Only 4.9% ( $n=49$ ) participants thought that they will be seriously ill from COVID-19 within six months and 39% ( $n=392$ ) participants

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were confident that they will get COVID-19. A total of 71.29% of the participants reported they would consider getting vaccinated once available. There was statistical association between gender and getting vaccinated ( $P < 0.001$ ).

**Conclusion:** This study demonstrated that majority of the participants showed positive attitude toward considering COVID-19 vaccine. However awareness with informed knowledge of efficacy, possible adverse effects and cost would be of added great value to increase the real response of Pakistani population toward COVID-19 vaccination.

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## Evaluación de la actitud y la renuencia hacia la vacuna frente a la COVID-19 en una población paquistaní: encuesta de método mixto

### R E S U M E N

#### Palabras clave:

Actitud  
Renuencia  
SARS-CoV-2  
COVID-19  
Vacuna  
Paquistán  
Método mixto

**Objetivo:** El objetivo de este estudio fue evaluar la actitud y la renuencia hacia la vacuna frente a la COVID-19 en una población paquistaní.

**Materiales y métodos:** Se realizó un estudio prospectivo de método mixto, invitándose a participar a personas adultas (edad  $\geq 18$  años) residentes en Paquistán. Se preparó el cuestionario, que se alojó en Google Forms y se hizo circular a través de plataformas electrónicas, pudiendo realizarse también de manera personal. Los datos se recopilaron desde el 15 de septiembre al 30 de noviembre de 2020.

**Resultados:** La tasa de respuesta fue del 80%. El análisis final incluyó un total de 1.003 participantes, de los cuales el 75% completó el cuestionario-encuesta online, mientras que el 25% respondió en persona. La edad media de los participantes fue de  $29,62 \pm 10,47$  años. La mayoría de los participantes eran mujeres: el 60,9% ( $n = 611$ ). El 57,02% ( $n = 572$ ) de los participantes tenía empleo en el momento de la encuesta. En general, el 70,68% ( $n = 709$ ) de los participantes tenía experiencia previa sobre vacunas tales como la vacuna frente a la gripe. Solo el 4,9% ( $n = 49$ ) de los participantes pensaba que padecerían la COVID-19 de forma grave en el plazo de seis meses, y el 39% ( $n = 392$ ) de los participantes estaba seguro de que se contagiaría de dicha enfermedad. El 71,29% de los participantes reportó que consideraría recibir la vacuna una vez que se dispusiera de la misma. Existió una asociación estadística entre el sexo y el ser vacunado ( $P < 0,001$ ).

**Conclusión:** Este estudio demostró que la mayoría de los participantes mostró una actitud positiva hacia la consideración de la vacuna frente a la COVID-19. Sin embargo, la concienciación sobre el conocimiento informado de la vacuna, los posibles efectos adversos y el coste supondrían un gran valor añadido al incremento de la respuesta real de la población paquistaní hacia la vacuna frente a la COVID-19.

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## Introduction

Vaccinations are one of the most significant advances in public health history, despite widespread anti-vaccination sentiments, behavior, and misinformation.<sup>1</sup> Evidence has suggested that vaccinations are efficient in protecting individuals, preventing serious and life threatening diseases. Coronavirus disease 2019 (COVID-19), the highly contagious infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has had a catastrophic effect on the world's demographics resulting in more than 2.9 million deaths worldwide, emerging as the most consequential global health crisis since the era of the influenza pandemic of 1918. In order to prevent and protect individual against COVID-19, there has been an implementation of the Covid-19 vaccination. COVID-19vaccinations are likewise exceedingly safe, with extremely minimal rates of serious side effects.<sup>2</sup> Countries across the

world have begun vaccinating their population against COVID-19 in order to mitigate the effects of the pandemic, in addition to social distancing efforts.<sup>3</sup> Similarly, the Pakistani government took this critical step and began immunizing health care personnel first, followed by the general population, beginning with the elderly population and then the young, all while keeping COVID-19's severity in consideration. In Pakistan, the roll out of the COVID vaccination is underway with 2,310,115 of the population fully vaccinated against COVID-19.<sup>4</sup>

Despite concrete evidence that vaccinations are effective, there is growing concern about immunizations. Vaccine hesitancy has resulted in a decrease in vaccine uptake and an increase in the prevalence of vaccine-preventable diseases (VPDs).<sup>5</sup> Surprisingly, the resistance to vaccinations is frequent as a result of their effectiveness because people are less likely to be exposed to VPDs. Hesitancy against the COVID-19vaccination is known all over the world, at a time when

attempts to establish herd immunity through widespread vaccine coverage have been prioritized.<sup>6</sup>

Pakistan is a lower middle income country (LMIC) which has already been under the shadow of a high vaccine hesitancy country. During the COVID-19 outbreak, various conspiracy theories arose on social media against the COVID-19 vaccination. The Pakistani population is particularly vulnerable to such conspiratorial narratives. Among these are the alleged inadequate quality of vaccinations, the questioning of dose standards, religious buy-in, and suspicions about the presence of live virus in vaccines.<sup>7</sup> These beliefs are being heavily contested on social media amongst the Pakistani society. Such narratives are mostly to blame for the country's failure to eliminate polio. In addition, these narratives have created seeds of vulnerability and vaccine hesitancy against the ongoing COVID-19 immunization efforts amongst the Pakistani population.

Vaccine hesitancy is a key obstacle to the control of vaccine-preventable illnesses. A long-term lockdown is not a viable solution in many nations owing to economic instability. The uptake of vaccinations may be the only method to restrict the pandemic's endurance.<sup>8</sup> The tendency for disease transmission in Pakistan is significant due to the weak healthcare system, dense population, and low adherence to hygienic standards. Pakistan has previously faced strong vaccine hesitancy against to polio vaccination; therefore, any poor public impression of COVID-19 vaccinations will lead to disastrous consequences for efforts to stop the pandemic.<sup>9</sup>

The COVID-19 pandemic has shown a greater magnitude in terms of transmissibility and mortality compared to previous influenza pandemics. Countries around the world, including Pakistan, are under enormous pressure to monitor the current pandemic and avoid a potential recurrence of dangerous waves or epidemics in the future through mass vaccination uptake. Vaccine hesitancy is on the rise, albeit it varies by country. In view of this, we aimed to assess the attitude and hesitancy toward the COVID-19 vaccination in the Pakistani population.

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## Material and methods

We conducted a mixed-method, prospective, study about COVID-19 amongst adult population in Pakistan in 2020. The aim of study was to explore the determinants of and correlation between the hesitancy of the COVID-19 vaccine and the belief in the sources of the novel coronavirus. The inclusion criterion for this study was an age restriction of 18 years old or older and a permanent Pakistani resident.

We used an anonymous online survey that respondents could opt to complete or not. The questionnaire was prepared, circulated and compiled using Google forms, an online tool that produces web-based surveys. Our questionnaire was adopted from a study conducted amongst the American population by Fisher et al.<sup>10</sup> Our questionnaire was transmitted through social media to adults all over the Pakistan. All participants provided informed consent before data collection. Data was compiled from 15th September 2020 to 30th November 2020. A convenient sampling procedure was used for the data collection purpose. The initial aspect of the survey comprised

of demographic details of the participants. In the second part of the survey, we evaluated the intent to be vaccinated for the COVID-19 with the question, "Do you want to be vaccinated?". The choices were 'yes,' 'no' and 'not sure.' Participants who replied 'no' or 'not sure' were asked one of the following open-ended questions that formed part of the qualitative analysis: "What makes you reluctant to get the vaccine?" Or "What leaves you uncertain if you're going to have the vaccine?"

We performed two rounds of pilot testing of the key concerns determining the intent to be vaccinated in a convenience survey of more than 100 individuals and did not detect any issues. The United Medical & Dental College Research Ethics Committee approved this study (Ref no: UMDC/Ethics/2020/27/08/393).

## Sample size and data analysis

Assuming the Pakistan adult Population to be 113,400,000,<sup>11</sup> with a vaccine acceptance of 57%<sup>10</sup> and margin of error 4% (95% CI: 53–61%), we calculated a minimum sample size of 600 adult individuals to be included in this. However, a total of 1003 participants were included in this survey. Results from this survey were analyzed using SPSS Version 24. The descriptive statistics including frequencies and percentages were calculated for general demographics of participants. An independent Kruskal–Wallis test was undertaken to identify if there was significance in participants age and whether they would consider getting the vaccination A Chi-Square test was used to compare demographics with participant's intention to be vaccinated or not. Statistical significance was set at  $\leq 0.05$  for both the independent Kruskal–Wallis test and Chi-Square tests.

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## Results

Of the 1003 participants included in this study, 75% of the participants completed survey questionnaire online through a Google form. Only 25% of all participants responded face to face. The response rate was 80% as some people refused to participate. The mean age of the participants was  $29.62 \pm 10.47$  years. There were a higher percentage of female participants 60.9% ( $n=611$ ) included in this survey. 57.02% ( $n=572$ ) of the participants were employed at time of survey. A total of 63.31% (635) participants were college graduate or above in terms of education level and 71.18% (xx) participants belong to urban part of the country. Approximately 70.68% ( $n=709$ ) of the participants had previous experience of vaccines for any other diseases like flu, hepatitis, polio etc. Only 4.9% ( $n=49$ ) participants think that they will be seriously ill from corona virus within 6 months and 39% ( $n=392$ ) participants were confident that they will get corona virus. In this survey, 51.6% ( $n=519$ ) participants marked their current state of health as "Good". However, only 1.2% ( $n=12$ ) participants choose "poor" for their current health status. Further characteristics of study population are presented in [Table 1](#).

A total 71.29% of the population reported they would get the vaccine and 10.47% reported they would not get the vaccination. However, 18.24% reported they were unsure if they would get vaccinated or not. Results from a chi-squared when taking

**Table 1 – Participant's characteristics n = 1003.**

<b>Age (in years)</b>		
Mean (SD)	29.62 (10.47)	
<b>Gender</b>		
	n	Percentage (%)
Male	390	38.8%
Female	611	60.91%
Prefer not to say	2	0.19%
<b>Ethnicity</b>		
Balochi	16	1.59%
Other	60	5.98
Pathan	48	4.78
Punjabi	174	17.34
Sindhi	156	15.55
Urdu	549	54.73
<b>Employment status</b>		
Employed	572	57.02
Unemployed	431	42.97
<b>Education level</b>		
College	211	21.03
College graduate or above	635	63.31
High school	111	11.06
No high school	46	4.58
<b>Annual household income</b>		
<10,000 PKR	289	28.81
10,000–50,000 PKR	415	41.37
51,000–100,000 PKR	181	18.04
>100,000 PKR	118	11.76
<b>Marital status</b>		
Divorced/widowed	18	1.79
Married	385	38.38
Single	600	59.82
<b>Household size</b>		
1–5 members	562	56.03
6–10 members	366	36.49
>10 members	75	7.47
<b>Setting</b>		
Urban	714	71.18
Rural	289	28.81
<b>Have you ever been vaccinated in the past for any other disease like flu, polio, hepatitis etc.?</b>		
Yes	709	70.68
No	294	29.31
<b>What is your best guess as to whether you will get the corona virus within the next 6 months?</b>		
I don't think I will get the corona virus	432	42.92
I think I will get a mild case of the corona virus	392	39
I think I will get seriously ill from corona virus	49	4.9
I have already had the corona virus	133	13.3
<b>Rate your current state of health?</b>		
Excellent/very good	348	34.6
Good	519	51.6
Fair	127	12.6
Poor/ill	12	1.2

gender into consideration showed there was statistical significance with gender and whether the individual would consider being vaccinated ( $P < 0.001$ ). Results from a Chi-squared test showed there was no statistical significance when taking ethnicity, employment status or income into consideration and if individuals would consider vaccination with  $P$ -values: 0.008, 0.11 and 0.79 respectively. An independent Kruskal–Wallis test showed there was no statistical significance in participants

age and whether they would consider getting the vaccination or not ( $P = 0.118$ ).

All participants, who answered no or not sure to the question, “Do you want to be vaccinated”, were given the option to specify their reasons. They were asked if you answer “No” (no/not sure), then please specify your reason why you don't want to be vaccinated against COVID-19? Of the 105 participants who said they would not have the COVID-19 vaccine, 84

**Table 2 – Reasons participants responding “no” or “not sure” regarding intent to be vaccinated.**

Themes and subthemes	Intent to be vaccinated	
	Not sure (n = 102)	No (n = 84)
<b>Financial issues</b>	N = 20 (20.4%)	N = 12 (10.8%)
Vaccine will be too expensive	5 (4.90)	3 (3.57)
Will be vaccinated, if it will be free of cost	10 (9.80)	7 (8.33)
Don't have money	5 (4.90)	2 (2.38)
<b>Trust issues</b>	N = 30 (30.6%)	N = 18 (15.12%)
Cannot trust government	5 (4.90)	10 (11.9)
Pharmaceutical companies	4 (3.92%)	2 (2.38)
Concern about manufacturing, processing and administration vaccine	11 (10.78)	6 (7.14)
<b>Safety and efficacy of the vaccine</b>	N = 30 (30.6%)	N = 22 (18.48%)
Side effects are not well published	6 (5.88)	10 (11.90)
It is a new vaccine	10 (9.8)	4 (4.76)
Quality and effectiveness of vaccine	12 (11.76)	5 (5.95)
Storage method of vaccine in Pakistan	2 (1.96)	3 (3.57)
<b>Anti-vaccine attitudes and beliefs</b>	N = 22 (22.44%)	N = 18 (15.12%)
Corona does not exist	5 (4.90)	5 (5.95)
Vaccine cannot be discovered in such short time	6 (5.88)	3 (3.57)
Flu vaccine is not effective, so this vaccine will also not work	5 (4.90)	5 (5.95)
Healthy individuals don't need vaccine	4 (3.92)	3 (3.57)
Vaccine will decrease natural immunity	2 (1.96)	2 (2.38)
<b>Others</b>	N = 10 (10.2%)	N = 14 (11.76%)
First give vaccination to high risk population like elders and health care providers	2 (1.96)	5 (5.95)
There is no vaccine for corona	5 (4.90)	5 (5.95)
Following SOPs and social distancing will make you immune against virus	3 (2.94)	4 (4.76)

decided to provide a reason as to why they would not have the vaccine. Of the 183 participants who said they were not sure if they would have the COVID-19 vaccine, 102 decided to provide a reason as to why they are unsure. The total of 186 participants who provided a reason for not intending to be vaccinated or being unsure as to whether they would be vaccinated referred to anti-vaccine attitudes, beliefs, or emotions.

The main themes for vaccine hesitancy were financial issues, not trusting entities involved in vaccine development, testing, government or dissemination, anti-vaccine attitudes and the safety and efficacy of the vaccine as reported in Table 2.

Twenty participants said they would not have the vaccine due the vaccine being too expensive and unaffordable. Seven of the 20 participants (38.89%) who reported they would not have vaccine due financial issues subsequently reported they would have the vaccine if available to them free of charge.

One participant reported that:

*“I am sure that I would not be able to effort a vaccine. But, I will definitely get a vaccine, if it will be free of cost”.*

With regards to the vaccine safety and efficacy, participants reported they would like to know the effectiveness of the vaccine prior to being inoculated. In addition, participants reported there were no post surveillance vaccine effectiveness reports and they did not want to be test subjects. Participants also reported they were unsure of the side effects and did not want to suffer the consequences of adverse reactions.

One participant quoted about the effectiveness of the vaccine that:

*“I think vaccine will not be effective and before vaccination I want to know about the side effects”.*

Another participant reported:

*“I don't want to get it because the side effects and long term hazards of vaccine are not well-established yet”.*

Surprisingly, no vaccine-hesitant participants indicated a need or desire for a recommendation from a physician.

Four participants had anti-vaccine attitudes and reported they do not believe in COVID-19, whilst a number of other participants reported they were hesitant to be inoculated because there are other mechanisms of being protected such as regular hand washing and the use of hand sanitizers and masks (Table 2).

One participant said that

*“There are many other ways to protect you from virus like washing hands, social distancing and wearing masks, so I don't believe in vaccine as it will not make any difference”.*

About anti-vaccine attitude one of the participant responded:

*“Corona virus is just like flu. As we know that the flu vaccine is not effective in many cases because virus changes itself so quickly. In my point of view, corona vaccine will not give any benefit”.*

Some participants also have wrong perceptions about vaccine like one participant said that:

*“If I don't have corona virus then why should I get vaccination?”.*

## Discussion

Our present study evaluated the attitude and reluctance of Pakistani population toward COVID-19 vaccine. This prospec-

tive study was performed between September 2020 and November 2020. By the end of November 2020, the case tally for COVID-19 in Pakistan had reached 400,482 cases and 8091 deaths as per report from the Government of Pakistan.<sup>12</sup>

Our findings demonstrated that over two-thirds of the study participants showed a positive attitude toward being vaccinated against COVID-19, once available. There are ongoing chains of debates in terms of the concept of herd immunity, lockdowns, adhering to social distancing, wearing facemasks and vaccinations to support the reduction of COVID-19 cases and its serious consequences. It is to be understood that only one preventive measure may not be sufficient to counteract this deadly virus on a global scale.<sup>13</sup> Earlier research study has suggested that high preventive self-care is linked with greater control over widespread epidemic.<sup>14</sup> Thus, this perceived susceptibility to the COVID-19 infection can only be infused with knowledge and awareness.

In our current study, 71.29% of the participants showed intent to consider the COVID-19 vaccination. One reason for this high percentage of vaccination intention in our study population could be a result of an increased number of well-educated participants in this study, highlighting the importance of education.

In contrast to our study, a report from a Southeast Asian country, Malaysia, by Wong et al. found vaccination intent of 94.3%.<sup>15</sup> Our findings were in agreement with a study conducted in USA which reported 67% vaccination intent.<sup>16,17</sup> We were unable to draw an inter-country comparison of the COVID-19 vaccine intent, as no such data is currently available in Pakistan at the moment.

In this study, the majority of the participants were interested to know about vaccine safety and efficacy before being inoculated. They would not want to be treated as test subjects or be the victims of adverse effects associated with the COVID-19 vaccine. Therefore, sufficient knowledge and awareness is necessary through evidence based studies.<sup>18</sup> Some of the participants believed that adhering to standard operating procedures such as washing hands, wearing masks and social distancing could provide enough protection against COVID-19. Moreover, the anti-vaccine attitude was also prevailing among Pakistani population as many people thought that vaccine would not be beneficial as they believe COVID-19 is similar to flu virus, which is rapidly changing its genetic material. Therefore, they stated that vaccine would not be effective in terms of reducing the spread and the severity of infection. These statements are highly suggestive of inadequate knowledge, word of mouth and myths. These inaccurate concepts were further pronounced with changing statements from World Health Organization (WHO) due to evolving situation of the COVID-19. All these above statements demand evidenced based education to the general public.<sup>18</sup>

Lazarus et al. conducted a survey to evaluate the COVID-19 vaccine acceptance in 13,426 randomly selected individuals across 19 countries with high COVID-19 burden. The aim of their study was to determine potential acceptance rates and factors influencing acceptance of a COVID-19 vaccine. Results for their study illustrated that 71.5% of the total participants showed a positive attitude toward the vaccine for COVID 19, if it proves safe and effective. However, they reported heterogeneous findings among countries. Middle income countries

such as Brazil, India and South Africa showed a high tendency of vaccine acceptance; there was no data available for LMICs in the survey undertaken by Lazarus et al.<sup>19</sup>

Pakistan is witnessing a great challenge with respect to acceptability of the Polio vaccine and a large number of the population are unable to gain confidence from this phenomena.<sup>20</sup> In consequence, a number of participants believe that COVID-19 is nothing more than a hoax. Despite this, our results show a positive attitude and low hesitancy toward COVID-19 vaccine.

The present study was not devoid of limitations. These limitations must be categorically mentioned to avoid any mis-interpretation of the findings. First and foremost, given the use of electronic platform (Google Forms and Emails) for data collection, sampling bias may have occurred and therefore external validity (generalizability) could have been compromised. Secondly, of note, there is a slight over-representation of females compared to males in this study. This could be owing to circulation of the questionnaire link to the referred members and that may have resulted in selection bias and eventually non-representativeness of the study sample. In addition, the study may have fallen to self-reporting bias since responses in the questionnaire were based on self-reporting and completed without the presence of a healthcare professional. In such studies, there is a limitation as participants have a preference to account socially acceptable responses. Of note, this study did not outline any other key factors that could have influenced the willingness of participants to vaccinate like booster vaccines, gaps between doses, duration of immunity offered by new vaccine and most importantly financial implications on the potential vaccine eligible population. In fact, the issue of availability of vaccine for a country with varying population dynamics, its presumed impact on population willingness was not asked. Within our study, we did not report the confidence and preference of the study sample in locally or internationally designed COVID-19 vaccines. In light of the above limitations, further research is needed to collate the metadata. This data will be pivotal and will guide health policy makers to devise apposite strategies such as public awareness and campaigns to precisely tackle the limited knowledge barrier and myths that could affect the vaccine acceptability and overall vaccination coverage, especially in areas where the virus is highly prevalent. Nonetheless, our findings for the very first time in Pakistan contribute immensely to project the potential willingness and hesitancy toward COVID-19 vaccination stemming from the thought process and understanding of the general public.

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## Conclusion

This study demonstrated that majority of the participants showed a positive attitude toward considering COVID-19 vaccine. The vaccine has been implemented in Pakistan effective of March 2021. Initially the vaccine is for the vulnerable population like health care providers and geriatric population. Despite the encouraging results from this study, the final vaccine uptake will very much be influenced by the efficiency and cost of vaccine given the low-middle income status of country. If the vaccination remains free of charge from the government

then there would be a greater uptake and it would be easier for the general population to be vaccinated. Moreover, awareness with informed knowledge of efficacy and possible adverse effects would be of great added value to boost the real response of the Pakistani population towards the COVID-19 vaccination.

### Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### REFERENCES

- Larson HJ, Jarrett C, Eckersberger E, Smith DM, Paterson P. Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: a systematic review of published literature, 2007–2012. *Vaccine*. 2014;32:2150–9.
- Calina D, Docea AO, Petrakis D, Egorov AM, Ishmukhametov AA, Gabibov AG, et al. Towards effective COVID-19 vaccines: updates, perspectives and challenges (Review). *Int J Mol Med*. 2020;46:3–16.
- Wouters OJ, Shadlen KC, Salcher-Konrad M, Pollard AJ, Larson HJ, Teerawattananon Y, et al. Challenges in ensuring global access to COVID-19 vaccines: production, affordability, allocation, and deployment. *Lancet (Lond, Engl)*. 2021;397:1023–34.
- Center, N., 2021. *National Command Operation Center*. [online] Ncoc.gov.pk. Available from: <https://ncoc.gov.pk/covid-vaccination-en.php> [accessed 6.6.21].
- Butt M, Mohammed R, Butt E, Butt S, Xiang J. Why have immunization efforts in Pakistan failed to achieve global standards of vaccination uptake and infectious disease control? *Risk Manag Healthc Policy*. 2020;13:111–24.
- Kestenbaum LA, Feemster KA. Identifying and addressing vaccine hesitancy. *Pediatric Annals*. 2015;44:e71–5.
- Masood SJTNYT. Pakistan's war on polio falters amid attacks on health workers and mistrust. 2019.
- Fu Y, Jin H, Xiang H, Wang N. Optimal lockdown policy for vaccination during COVID-19 pandemic. *Financ Res Lett*. 2021, 102123.
- Basharat S, Shaikh BT. Polio immunization in Pakistan: ethical issues and challenges. *Public Health Rev*. 2017;38:6.
- Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. Attitudes toward a potential SARS-CoV-2 vaccine: a survey of US adults. *Ann Intern Med*. 2020.
- Statista. Pakistan: number of adults 2019; 2020. Available from: <https://www.statista.com/statistics/667736/number-of-adults-in-pakistan/>.
- GoP. COVID-19 2020. Available from: <https://covid.gov.pk/stats/pakistan>.
- Glinisky GV. Impact of pre-existing SARS-CoV-2 reactive T cells in uninfected individuals on COVID-19 mortality in different countries; 2020.
- Verelst F, Willem L, Beutels P. Behavioural change models for infectious disease transmission: a systematic review (2010–2015). *J R Soc Interface*. 2016;13, 20160820.
- Wong LP, Alias H, Wong P-F, Lee HY, AbuBakar S. The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay. *Hum Vaccin Immunother*. 2020;16:2204–14.
- WHO. World Health Organization coronavirus disease (COVID-19) dashboard. 2020.
- Malik AA, McFadden SM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine*. 2020.
- Lin Y, Hu Z, Zhao Q, Alias H, Danaee M, Wong LP. Understanding COVID-19 vaccine demand and hesitancy: a nationwide online survey in China. *PLOS Negl Trop Dis*. 2020;14:e0008961.
- Lazarus JV, Ratzan SC, Palayew A, Gostin LO, Larson HJ, Rabin K, et al. A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med*. 2021;27:225–8.
- Ali M, Ahmad N, Khan H, Ali S, Akbar F, Hussain Z. Polio vaccination controversy in Pakistan. *Lancet*. 2019;394: 915–6.