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## Original Research Article

# Attitude, perceptions and willingness to receive COVID-19 vaccine and their associated factors among general population of Uttar Pradesh, Northern India

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## ABSTRACT

**Background:** Several vaccines have been developed and tested against COVID-19 around the globe. Vaccine hesitancy and misinformation poses major challenges to the achievement of coverage and population immunity. Understanding key determinants that influence the preferences and demands of a COVID-19 vaccine by the community may help to develop strategies for improving coverage.

**Objective:** To assess willingness for the corona virus disease 2019 (COVID-19) vaccine and identify the factors associated with it.

**Material and Methods:** A web-based cross-sectional study was conducted among unvaccinated general population of Uttar Pradesh, Northern India adopting an exponential, non-discriminative snowball sampling technique. A bilingual, self-administered anonymous structured questionnaire in google form was designed and sent to the study participants through social media platforms. Data collected were extracted in excel sheets and analyzed using SPSS software, version 21.0. Bivariate analysis was performed to identify the key determinants for vaccine acceptance among the participants.

**Result:** Out of 254 participants completing the questionnaire, 219 (86.2%) showed willingness to receive a COVID-19 vaccine, whereas 10 (4.0%) admitted hesitancy and 25 (9.8%) were not sure. Younger age-group (18-44 years), female gender, absence of any co-morbidity, lower education level, current employment status, positive history of confirmed COVID-19 infection in the person and positive history of confirmed COVID-19 infection in any family member/friend were the factors found to be significantly associated with the willingness to receive a COVID-19 vaccine.

**Conclusion:** During the second wave of COVID-19 pandemic in India, high acceptance for COVID-19 vaccination was found among the general population of Uttar Pradesh, whereas concerns about vaccine safety may hinder the actual vaccine uptake.

**What We Already Know:** (1). Mass vaccination against COVID-19 is one of the effective way of controlling the ongoing pandemic of COVID-19 (2). There is a variable acceptance of COVID-19 vaccines in different populations and sub-groups across the globe (3). Vaccine hesitancy for COVID-19 vaccines can disrupt the efforts for containment of the pandemic.

**What This Article Adds:** (1) Acceptance for COVID-19 vaccines among the general population of a North Indian state is seemingly high; (2). However, concerns about vaccine safety may hinder the actual vaccine uptake; (3). Targeted health education interventions are needed to increase the uptake of the COVID-19 vaccines in this population.

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## 1. Introduction

The ongoing coronavirus disease-2019 (COVID-19) pandemic COVID-19 has come up with various life-

threatening issues involving public, administrative and healthcare sectors. The whole world is facing catastrophic economic consequences, including a threat of collapsing public health system due to the ongoing pandemic. The high surge in the number of cases worldwide led the World Health Organization (WHO) to declare it as “a public health emergency of international concern” on January 30<sup>th</sup>, 2020 where the overall mortality rate was 3.4%.<sup>1,2</sup> On March 11, 2020, WHO reassessed the situation and declared COVID-19 a global pandemic. Various preventive strategies and therapeutic guidelines have been issued by the various authorities like WHO and Ministry of Health & Family welfare (MOHFW), Government of India from time to time. As immunization is one of the most successful and cost-effective health interventions to prevent infectious diseases, vaccines against COVID-19 are considered to be of great importance in prevention and control of COVID-19.<sup>3</sup> A number of vaccines were developed across the globe with different efficacy. However, public acceptance of vaccine is dependent on beliefs and perception toward the vaccine. Concern about vaccine hesitancy is growing worldwide:<sup>4</sup> in fact, WHO identified it as one of the top ten global health threats in 2019.<sup>5</sup>

Government of India (GoI) has given Emergency Use Authorization (EUA) for home developed Bharat Biotech's Covaxin and Serum Institute of India's version of Oxford-AstraZeneca Covid-19 vaccine named Covishield following recommendations of Expert Committee set up by the Drugs Controller General of India (DCGI). Prime Minister of India formally launched World's largest Covid-19 vaccination drive across India on 16<sup>th</sup> January 2021. Covid-19 vaccine roll out in India was sequential with health care workers on the top priority, followed by front line workers and the prioritized age groups. From 1st May 2021, India started vaccination of its citizens above 18 years of age. But there are several misconceptions and barrier to vaccine acceptance among general public. Vaccine hesitancy and misinformation poses major challenges to the achievement of adequate coverage and population immunity.<sup>6,7</sup> Anti-vaccination activists are campaigning in several countries since the beginning against the need for a vaccine, with some even denying the existence of COVID-19 Pandemic altogether.<sup>8</sup> Misinformation spread through multiple channels, could have a considerable effect on the acceptance of COVID-19 vaccines. Expressing one's willingness to get vaccinated might not be necessarily a good predictor of acceptance, as vaccine decisions are multi factorial and can change over time. Lessons learned from previous outbreaks including HIV, H1N1, SARS, MERS and Ebola, remind us that trusted sources of information and guidance are fundamental to disease control. Addressing vaccine hesitancy is not just building trust. Understanding the influencing factors for acceptance of COVID-19 vaccination and identifying common barriers

and facilitators for vaccination decisions are important aspects in the design of effective strategies to improve the vaccine coverage among the general population.<sup>9</sup>

With this background, this online survey was planned and conducted to assess the willingness of the general public to receive a COVID-19 vaccine and their associated factors thereby identifying the various issues and challenges that might be faced by government and health care workers for successful implementation of COVID-19 vaccination drive in India.

## 2. Materials and Methods

### 2.1. Study design and settings

This was a web based cross-sectional study conducted between 1<sup>st</sup> May 2021 and 30<sup>th</sup> May 2021 among the general population of Uttar Pradesh (U.P.), Northern India. Uttar Pradesh is largest state of India by population with around 17% of its total population (Census 2011). The study population consisted of unvaccinated adult residents of the state of Uttar Pradesh, North India who were eligible to receive the COVID-19 vaccine after 1<sup>st</sup> May, 2021 onwards.

### 2.2. Sample size and sampling

Taking prevalence of willingness to receive COVID-19 vaccine as 78.6% from a recent pan India study by Jacob et al.<sup>10</sup>, Confidence interval as 95%, power of the study as 80% and absolute precision as 5%, the minimum sample size was calculated as 254. An exponential, non-discriminative snowball sampling technique was used to recruit the study participants through the social media platform WhatsApp. To obtain a more naturalistic sample we had neither inclusion nor exclusion criteria and anyone who was found eligible as per GoI notification (anyone 18 years or above, non-pregnant, non-lactating) to receive COVID-19 vaccine was invited for the study.

### 2.3. Study questionnaire and its administration

The study questionnaire was designed in consultation with the experts. It consisted of sections on sociodemographic, perception and acceptance towards the new COVID-19 vaccines, history of reverse transcription-polymerase chain reaction (RT-PCR) testing and results, and finally about their opinion about the risks and benefits of the vaccination. Participants were asked about the source of their knowledge about COVID-19 vaccines and their willingness to accept the COVID-19 vaccine. Questionnaire's content and clarity was assessed by the psychiatrists working in the same institute of the author. A Pilot study was undertaken with a sample of 20 participants from the authors' institute (selected by convenience) to know the average time required for completing the questionnaire in Google form and to ensure that it is appropriate and understandable to

participants. The final questionnaire was developed based on Cronbach's alpha value  $>0.70$ .<sup>11</sup> Pilot population were not part of the final study sample and the questionnaire was revised after making necessary amendments based on the findings of the pilot study. The survey questionnaire prepared in English, was forward translated to Hindi, the local language, performed by a bilingual, then another bilingual performed a backward translation to English; the translated versions were compared and checked until a final draft was prepared.

The questionnaire was self-administered. The participants were instructed to select one/multiple options from the list of responses. On receiving and clicking the link of the google form, participants got auto-directed to a detailed participant information sheet and consent agreement option. Only those who consented were permitted to proceed further with, the survey questionnaire.

#### 2.4. Data collection and statistical analysis

The results of Hindi responses, the local language, were translated to English and were combined in one data sheet for analysis. The data obtained from the google form responses were extracted in excel sheets and analysed using statistical package for the social sciences (SPSS), version 21.0 (IBM Corporation, Armonk, NY, USA). Descriptive statistics was performed to describe the demographic characteristics and the outcome variables. Chi-square and fisher exact tests were used to determine the variables having a significant association with willingness for the COVID-19 vaccine. A two-tailed p-value  $< 0.05$  was taken as statistically significant.

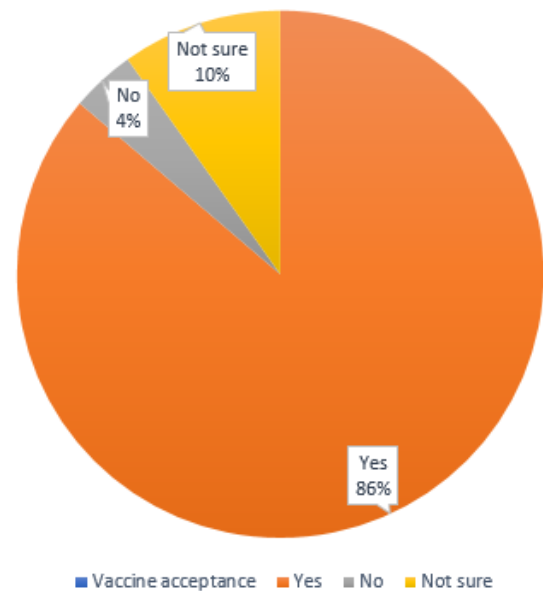
### 3. Results

A total of 254 individuals consented and participated in the study by completing the study questionnaire. Socio-demographic characteristics of the study participants have been presented in Table 1. Majority were in the age-group of 18-44 years (86.2%), males (54.7%), married (70.5%), Hindu by religion (74.8%), either graduates or postgraduates (82.2%), had monthly income up to INR 50,000 (56.6%) and were living with either kids or elderly or both (82.3%). Majority (82.3%) of the study participants reported not to have any co-morbid condition with hypertension (7.5%) being the most common co-morbidity followed by diabetes (3.9%).

A total of 225 (86.2%) out of the 254 participants showed willingness to receive the COVID-19 vaccine (Figure 1).

#### 3.1. Attitude and perception towards COVID-19 vaccination

Respondents who trusted safety and effectiveness of the government provided vaccine were more likely to accept the vaccine than those who said that they did not (Table 2).



**Fig. 1:** Willingness to receive COVID-19 vaccine in the study participants (N=254)

On bivariate analysis, socio-demographic factors found to be significantly associated with willingness to receive COVID-19 vaccine were younger age (18-44 years), female gender, absence of any-comorbidity, lower education level (up to senior secondary), being student, housewife or unemployed, positive history of lab confirmed COVID-19 infection among any family member/friend (Table 3).

#### 3.2. Barriers to COVID-19 vaccination

With regard to reasons for not getting vaccinated for COVID-19 till date, majority (54.7%) of the participants gave the reason of not able to register for receiving the vaccine whereas around 14% gave the reason that they were waiting for other better options/alternatives. Only 7.9% of the participants agreed that their religion/culture prohibits them from vaccination. With regard to various fears associated with the vaccination, major one was the fear of getting the COVID-19 infection post vaccination seen in about 12% of the participants (Table 4).

### 4. Discussion

The present study reported a high level of acceptance for COVID-19 vaccination among the surveyed population during second wave of COVID-19 pandemic in India. More than half (72.4%) of respondents in the vaccine accepting group wanted to get vaccinated as soon as possible when it was available to them, while others (27.6%) would delay the vaccination until further vaccine's safety is confirmed. A relatively high tendency of acceptance was found among the middle income class and lower

**Table 1:** Socio-demographic characteristics of study participants (N= 254)

Variables	Categories	Frequency	Percentage
Age (in years)	18- 44	219	86.2%
	45- 59	30	11.8%
	60 and above	5	2.0%
Gender	Female	115	45.3%
	Male	139	54.7%
Marital status	Married	179	70.5%
	Unmarried	75	29.5%
Religion	Hindu	190	74.8%
	Muslim	44	17.3%
	Indian	5	2.0%
	Prefer not to say	6	2.4%
	Sikh	4	1.6%
	Atheist	5	2.0%
Education	Up to class 8 <sup>th</sup>	15	5.9%
	Up to class 12 <sup>th</sup>	30	11.8%
	Graduate	104	40.9%
	Post Graduate and above	105	41.3%
Occupation	Student	50	19.7%
	Housewife	30	11.8%
	Govt. employee	58	22.8%
	Non-govt. Employee	55	21.7%
	Retired	2	0.8%
	Unemployed	25	9.8%
	Others	34	13.4%
Working environment	At home	82	32.3%
	Face to face interaction with Public	68	26.8%
	At Office, no public dealing	60	23.6%
	Isolated outdoor environment	44	17.3%
Total monthly family income (in INR)	Less than 10000	30	11.8%
	10001 to 30000	74	29.1%
	30001 to 50000	40	15.7%
	50001 to 75000	65	25.6%
	75001 to 100000	15	5.9%
	100001 to 200000	25	9.8%
	More than 200000	5	2.0%
Living persons at home	Kids	85	33.5%
	Elderly	25	9.8%
	Both	99	39.0%
	None	45	17.7%
Comorbid condition	None	209	82.3%
	Diabetes	10	3.9%
	HTN	20	7.9%
	DM+ HTN	6	2.4%
	Heart Disease	5	2.0%
	Skin Disease	4	1.6%

**Table 2:** Attitude and perceptions of study participants towards COVID-19 vaccination (N=254)

Questions	Frequency	Percentage
Most trusted source for covid-19 vaccine*		
1. Family members/Friends	51	20.0%
2. Family doctor	97	38.2%
3. Social media	17	6.7%
4. Television and newspaper/magazines	31	12.2%
5. Leading doctor in any field	43	16.9%
6. Only experts working in that field	78	30.7%
Biggest hesitancy with COVID-19 vaccine*		
1. Too much conflicting information	94	37.0%
2. Worried about getting COVID-19 from vaccine itself.	32	12.6%
3. Worried about how much I will have to pay for the vaccine.	18	7.0%
4. Scared of shots in general, COVID is just another one	13	5.1%
5. Vaccine is not necessary for me.	29	11.4%
6. Other	98	38.6%
Compelling benefit to take the COVID-19 vaccine at earliest*		
1. Prevent more people from getting sick and deaths	174	68.5%
2. Reopen the economy and get people back to work faster	54	21.3%
3. Close to my friends and loved ones with peace of mind	49	19.3%
4. Resumption of social gathering	46	18.1%
5. Other	51	20.0%
Drawbacks of not taking vaccine*		
1. Damage to the economy from continued lockdowns	94	37.0%
2. Potential for friends and family to become ill/ worse	98	38.6%
3. Increasing burden on healthcare system	92	36.2%
4. Loss of our freedoms to live our lives	48	18.9%
5. Bad impact on education	62	24.4%
6. Other	56	22.0%

\*Not mutually exclusive

education level. Unless and until the causes of such wide variation in willingness to accept a COVID-19 vaccine is better understood and addressed, differences in vaccine coverage among community could potentially delay country level control of the pandemic and the ensuing societal and economic recovery. Among respondents who accepted vaccination, significant factors influencing their vaccination acceptance were gender, marriage status, and risk perception, belief of COVID-19 vaccine efficacy, valuing their family doctor's recommendations, vaccination convenience or vaccine price. The high acceptance of and positive attitude toward COVID-19 vaccination among the population reflected the strong demand for the vaccine and the high recognition of the importance of vaccines in controlling pandemic specially during second wave and news in media regarding a probable third wave by the end of 2021. Our study is in line with a study conducted by Jeffery et al. which showed majority (71.5%) of the surveyed individuals were likely to accept the vaccine.<sup>11</sup> We found that about one third of study participants (29.5%) held strong beliefs about the efficacy of COVID-19 vaccination, as 70.5% thought that vaccination is an effective way to prevent serious COVID-19 illness, even though the vaccine is still not available to all at the time of survey.

Additionally, we observed age-related associations with vaccine acceptance. Younger people (90.9%) were more likely to report that they would get a COVID-19 vaccine, compared to people in the age-group of 45 years and above (55.9%), the difference being statistically significant ( $p < 0.0001$ ). Similarly, men in this study were less likely than women (82% vs 91.3%) to accept COVID-19 vaccine which was also found by Jeffrey et al. in a global survey.<sup>11</sup>

Unwillingness to receive COVID-19 vaccine was high (44.1%) among the older age-group compared to the younger age-group (9.1%) in our study. This differs from the vaccine acceptance rates among the older population of Saudi-Arabia and US, where higher prevalence of COVID-19 vaccine acceptance were found.<sup>12,13</sup> This is peculiar to the sub-population of Low and Middle income Countries (LMICs) and seeks special attention for this vulnerable group.

Although a high willingness for COVID-19 vaccine was observed in our study, there are still some barriers in the process of moving from the vaccination intention to real uptake behaviour. However, broader public health campaigns to include those who are already willing may also be beneficial in helping them to engage more effectively when they encounter misinformation.<sup>14</sup> Around

**Table 3:** Factors associated with willingness to receive COVID-19 vaccine among the participants (n=254)

Variables	No. (%) showing willingness for vaccination	No. (%) showing unwillingness for vaccination	P-value
<b>Age-group (in years)</b>			
18-44	200(90.9)	20(9.1)	<0.0001
45 and above	19(55.9)	15(44.1)	
<b>Gender</b>			
Male	114(82.0)	25(18.0)	0.03
Female	105(91.3)	10(8.6)	
<b>Co-morbidity</b>			
Present	29(65.9)	15(34.0)	<0.0001
Absent	190(90.5)	20(9.5)	
<b>Education level</b>			
Up to Senior secondary(12th)	45(100.0)	0(0.0)	0.003
Graduate & above	174(83.3)	35(16.7)	
<b>Employment status</b>			
Unemployed/Student/Housewife	105(100.0)	0(0.0)	< 0.0001
Employed	114(76.5)	35(23.5)	
<b>Marital status</b>			
Unmarried	159(88.8)	20(11.2)	0.06
Married	60(80.0)	15(20.0)	
<b>Monthly income (in INR)</b>			
Less than 10,000	25(83.3)	5(16.7)	0.09
10,001-50000	105(91.3)	10(8.7)	
More than 50,000	89(81.7)	20(18.3)	
<b>History of confirmed COVID-19 infection in participants</b>			
Present	50(66.7)	25(33.3)	< 0.0001
Absent	169(94.4)	10(5.6)	
<b>History of confirmed COVID-19 case in family/friends</b>			
Present	79(72.5)	30(27.5)	<0.0001
Absent	140(96.6)	05(3.4)	

**Table 4:** Barriers towards acceptance of COVID-19 vaccine among the study participants (N=254)

Potential barriers	Categories	Frequency	Percentage
Why not vaccinated till now	Pregnancy	15	5.9%
	Breast feeding	10	3.9%
	Waiting for better options/alternatives	35	13.8%
	Failed to register	139	54.7%
	Others	55	21.7%
Religion/culture against Vaccination	No	234	92.1
	Yes	20	7.9
Pressure from pharma company	Agree	85	33.4%
	Disagree	89	35.0%
	Not sure	80	31.5%
Fear of AEFI*	Some infected post-vaccination	30	11.8%
	Few deaths post-vaccination	25	9.8%
	Blood clot post-vaccination	5	1.9%
	Skin allergy post-vaccination	5	1.9%

one third of respondents (27.6%) with vaccination intention would delay vaccination until the safety of the vaccine is confirmed, and concerns or uncertainty about vaccine safety led to their vaccine hesitation. Public concern about vaccine safety has frequently been reported as the major obstacle to vaccination decision-making, especially for newly introduced vaccines which have not been fully tested in the real world.<sup>15-17</sup> For example, 13% of Australian people stated that they would wait to see if there were any adverse events before agreeing to get vaccinated, while their acceptance rate was as high as 67%.<sup>18</sup> As the majority (86.2%) of respondents had the intention of getting vaccinated, it is meaningful to identify other barriers or facilitators to their vaccination decision on whether to accept vaccination as soon as possible. Vaccine acceptance was found to be high in those individuals who were more confident about vaccine safety than those who were not confident about vaccine safety (96.9% vs 66.6%;  $p$  value < 0.001). The risk perception of respondents was an important predictor for vaccination acceptance, as those who perceived a high or very high risk of infection were more likely to get vaccinated as soon as possible instead of delaying it. Those participants who have COVID-19 patients in their family/ friends were more likely to take the vaccine ( $p < 0.001$ ). Future vaccine communication strategies should consider the level of attitude and belief, scientific and general literacy in community, identify national icons and locally trusted sources of information<sup>19</sup> and go beyond simply pronouncing that, vaccines are safe and effective. Furthermore, we found that those who valued doctor's recommendations tended to get vaccinated immediately, while those who valued vaccination convenience or vaccine price in decision-making tended to opt for delayed vaccination. Strategies to build vaccine literacy and acceptance should directly address community-specific concerns or misconceptions, address historic issues breeding distrust and be sensitive to religious or philosophical beliefs.<sup>20,21</sup>

## 5. Conclusion

During the second wave of pandemic a strong demand for and high level of acceptance of COVID-19 vaccination was observed among the general population of U.P., Northern India while concerns about vaccine safety may hinder the vaccine uptake. To expand vaccination coverage, immunization programs should be designed to remove barriers in terms of vaccine price and vaccination convenience, and health education and communication from authentic sources are important ways to alleviate public concerns about vaccine safety.

## 6. Recommendations

Our findings are useful for designing effective vaccination strategies and immunization programs for those with vaccine hesitancy for COVID-19. A careful balance is required between educating the community about the need for universal vaccine coverage and overcoming various barriers. This may be done in following ways:

1. Influential community-based groups such as local and family physicians and non-governmental organizations (NGOs), are required to help build trust in the COVID-19 vaccines.
2. Interventions focusing on improving healthcare workers' confidence and communication skills are required.
3. Flyers and handouts, social media messages, and posts explaining how & where members of the public can find reliable and accurate information about the vaccines are required.

### 6.1. Limitations

This survey was conducted in the context of a highly dynamic and changing landscape, with daily variations in perceived disease threat and COVID-19 vaccine development itself. Despite the diversity of the sample and the rich demographic measures, it may have been possible that more extreme views on vaccines were not adequately captured or that certain specific sub-groups within the population may not have been fully represented. Furthermore, only participants who have access to the internet and using the social media platform could participate in the study, hence restricting the generalizability.

## 7. Ethical Approval

Ethical approval for this study was obtained from the Institutional Ethical Committee (IEC) of BRD medical College, Gorakhpur, U.P., India vide letter no. (IEC/BRD/134/2021). Participation in the study was voluntary. Online written informed consent was obtained from each participant and the anonymity of the participants was maintained.

## 8. Ethical Considerations

This study was approved by Institute Ethical Committee of BRD Medical College, Gorakhpur (U.P.). The purpose of the study was explained and the participation was entirely voluntary. Informed consent was obtained from the participants.

## 9. Authors' Contributions

Study concept and design: IAK, MAB; Acquisition of the data: HCT, IAK; Analysis and interpretation of the data: HCT, MAB; Drafting of the manuscript: IAK, MAB; Critical revision of the manuscript for important intellectual content: HCT, MAB.

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## 11. Source of Funding

None.

## 12. Conflict of Interest

None.

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