



Research Article

Factors associated with COVID-19 vaccine hesitancy: a community-based household survey in Pune district of Maharashtra, India

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Background

In the wake of the coronavirus (COVID-19) pandemic, the development of the COVID-19 vaccine became a game-changing tool. However, the rapid development of the COVID-19 vaccine gave rise to various myths, misconceptions and hesitancies among people.

Methods

A community-based household survey was conducted by the trained healthcare workers, i.e., Accredited Social Health Activist (ASHA) and Anganwadi Worker (AWW) in their respective villages. Information on socio-demographic profile, vaccination status and reasons for vaccine hesitancy in community members was collected during the survey. Details of the vaccination status of community members were cross-examined with government vaccination data. After survey administration, continuous sensitisation to every individual was carried out by trained healthcare workers making people aware and motivating them to vaccinate. Healthcare workers constantly followed up on individuals showcasing hesitancy, thereby building up vaccine confidence in them.

Results

Out of the total study population (N=12,812), 90.1% were found eligible for COVID-19 vaccination (>18 years), 57.8% individuals had received both doses of COVID-19 vaccine, and 23.2% had received only the first dose (partially vaccinated), whereas 9.1% were unvaccinated. The most reported vaccine hesitancy response was being worried about vaccine side effects at 9.2%. The other set of reasons reported among aged 60 years and above were being old (1.6%) and having a co-morbid condition (1.1%). Having an underlying illness was also reported in both age groups (45-60 years, and 60 years and older). Additionally, 18.2% of the unvaccinated and partially vaccinated eligible individuals reported planning to get vaccinated soon.

Conclusions

The study reported many myths and misconceptions, and hesitancies related to the COVID-19 vaccine among the community members being a major lag in the vaccine acceptance and uptake. Therefore, adequate vaccine education is much needed to engage the non-medical group, as they mostly tend to have positive interactions with the community members. On that account, sustained community-based health promotion intervention can be effective.

Coronavirus (COVID-19), was declared a pandemic by the World Health Organization (WHO) in March 2020.^{1,2} This has led to a dramatic loss of human life along with social and economic disruption leading to extreme poverty, food insecurity, job loss, loss of access to productive assets, accessibility to quality healthcare.^{3,4} It has equally impacted both underdeveloped and developed countries,^{5,6} but low and middle-income countries in particular with

sizable marginalised populations have been hit the hardest.^{1,7,8}

Presumptively, the massive loss of human life urged the scientific community to find answers regarding therapeutics and vaccines to control severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Researchers worldwide aggressively worked round the clock to develop a vaccine against COVID-19. The Government of India started the national COVID-19 vaccination program in January 2021 in

a phased manner.^{9–11} Nevertheless, COVID-19 vaccine acceptance, uptake and hesitancy remain complex, although the vaccine was developed to ensure safety and effectiveness.¹² The World Health Organization defines vaccine hesitancy as a “delay in acceptance or refusal of safe vaccines despite availability of vaccine services”.^{13,14}

Achieving sufficient vaccination coverage against infectious diseases was a major problem.¹⁵ People hesitate to take the vaccine for many reasons, from personal views, fear, and logistical support to reach the vaccination site.¹⁶ In the case of the COVID-19 vaccine, most health workers’ beliefs about the vaccine were not uniform, and they were hesitant to get vaccinated, negatively impacting the general population’s perception of COVID-19 vaccination.¹⁷ This factor negatively influenced their families, society and others.^{18,19} Few global studies also indicated that common people are hesitant to vaccinate. A cross-sectional study conducted via an online survey across six continents determined knowledge, attitudes, and acceptance of a COVID-19 vaccine by depicting that over half of the respondents refused to take the COVID-19 vaccine.²⁰ Another study conducted in Zimbabwe reported that people were uncertain about the vaccine’s effectiveness and lacked confidence in the vaccine’s safety.²¹ A study conducted at the national level in Delhi, India, showed the association of vaccine hesitancy with varied factors such as older age, low perceived susceptibility, low perceived severity, and low self-efficacy to protect themselves from COVID-19.²² Furthermore, a COVID-19 vaccine hesitancy reported vaccine hesitations in Indian population. Urban, highly educated, and full-time employed individuals were more likely to say ‘no’ or ‘not sure about the COVID-19 vaccine as they were not heavily affected due to pandemics. On the contrary, those severely affected economically or who had no income or employment were more likely to accept the vaccine in the hope of getting back to work and everyday life.²³ Therefore, addressing the drivers of vaccine hesitancy and the obstacle to vaccine acceptance is a complex but important issue. The WHO and the previous literature also reveal that the vaccination program should be successfully enforced by optimising the training of health care professionals in practice and people working at the grassroots level to ensure that they have updated knowledge and positive attitude towards a vaccine, including building up vaccine confidence among them is the best way to improve acceptance.²⁴ This paper aimed to understand the hesitations related to the COVID-19 vaccination among community members and to positively influence vaccine uptake by implementing a community-based COVID-19 vaccine awareness programme by healthcare workers (HCWs).

METHODS

SAMPLING AND SELECTION OF PARTICIPANTS

Maharashtra is the second-most populated state in India with a population of 112.4 million^{25–27} and was also one of the hardest hit states during the COVID-19 pandemic.^{28,29} Based on these grounds, this state was purposively selected for the study. A community-based household survey was

conducted with community members from two blocks out of the total 14 blocks situated in the Pune district of Maharashtra. The two blocks, Velhe and Haveli³⁰ were purposively selected as these were within proximity to the local research office. Haveli block is located in the centre of the Pune district. It consists of about 123 villages and has the highest population, i.e. 658,928, as per the 2011 census.³¹ Velhe block comprises 128 rural villages with about 54,516 population.³²

According to the structure of the Indian Public Health-care system under the National Rural Health Mission (NRHM), at the tertiary level (Public Health Centre, sub-centres) of healthcare service delivery, there is one ASHA (Accredited Social Health Activists) worker for every 1000 population in tribal areas and 1500 population in non-tribal areas.^{33,34} ASHA’s form the major driving force of HCWs in villages. For the study, a total of 12,812 community members from 18 villages were surveyed by the trained community HCWs. The HCWs involved in the study were also officially working under the Government of India, NRHM.

The HCWs were initially trained to administer the community-based household survey. Data collection was initiated in August 2021 and continued up to February 2022; for about a period of seven months. The survey collected the socio-demographic profile, vaccine eligibility status (fully/partially/unvaccinated) and the reason/s for vaccine hesitancy in unvaccinated and partially vaccinated individuals. During the survey, the HCWs visited every household, assembling information on the vaccine dose received by every eligible individual. In the case of unvaccinated individuals, the reasons for vaccine hesitancy were recorded and the person was constantly followed up and monitored. The HCWs were also engaged in raising awareness, influencing positive attitudes, and building up the confidence of people in the COVID-19 vaccine by targeting every individual.

Only those individuals from the selected villages, who were eligible for COVID-19 vaccination, were included in the study. The criterion of eligibility status for COVID-19 vaccination was based on the guidelines provided by the National Expert Group on Vaccination Administration of COVID-19 (NEGVAC). According to the guidelines, the vaccination drive was only open to citizens older than 18 years of age during the study (March 2021 to February 2022). Since there was no vaccine available for the population under 18 years in India at that time of the study, the population below 18 years of age was termed a non-eligible group and excluded from the study.

DATA ANALYSIS

The data was analysed using the SPSS (Statistical Package for Social Sciences) version 26.³⁵ Simple descriptive statistics, including the means and percentages, were used for the analysis of data on vaccine acceptance and reasons for hesitancy.

ETHICS CONSIDERATIONS

The study was approved by the Institutional Ethics Committee of the Public Health Foundation of India and the

Janaseva Foundation. It was reviewed by the Institutional Ethics Committee of Public Health Foundation of India (TRC-IEC 466/21) and Janaseva Ethics Committee (Ref no:404A/06/2021) and exempted from human subject's research oversight. The study was conducted considering all necessary permissions from the respective authorities at the village and the district level. Participation was entirely voluntary and the respondents were informed about their rights to withdraw from the study without any penalty. Privacy and confidentiality of the obtained data were also maintained.

RESULTS

A total of 12,812 individuals from both the study blocks (Haveli and Velhe) participated in the household survey. The entire vaccine-eligible population had been divided into three categories per their vaccination status i.e. partially vaccinated, fully vaccinated and unvaccinated. The partially vaccinated population comprised eligible people who had received only the first dose of the vaccine and not the second dose (there were two doses of the vaccine available for an individual as per the Government of India at the time of our study). Fully vaccinated people were those who had received both doses of vaccine, and unvaccinated were those who had not received even a single dose.

A majority, 90.1% of the population, was eligible for COVID-19 vaccination (>18 years of age). Of the total vaccine-eligible individuals, 57.8% had received both doses of the vaccine (fully vaccinated) and 23.2% had received their first dose only (partially vaccinated), and 9.1% were unvaccinated. 9.9% of individuals were from the non-eligible (<18 years) age group of vaccination and were excluded from the study.

AGE-WISE DESCRIPTION OF VACCINATION STATUS OF THE STUDY PARTICIPANTS

Table 1 defines the vaccination status of individuals from different age groups. Overall (90.1%) of the study participants were eligible for COVID-19 vaccination. 9.9% of the study participants were under the age of 18 years and thus were considered non-eligible (represented as '0' in **Table 1**). Individuals were classified based on age, as per the NEGVAC's phased age-wise classification for the introduction of COVID-19 vaccination in India (60+ years, 45-59 years and 18-44 years). 52.4% belonged to the age group 18-44 years, 19.4% formed the age group 45-59 years and 18.3% of the sample were above the age of 60 years. The mean age of the study population was 2.46 ±0.901SD years and the overall response rate was 99.8%. In the age group 18-44 years; 46.3% of people were found to be partially vaccinated and 28.3% were fully vaccinated. In the age group 45-59 years, 18.1% were partially vaccinated whereas 14.9% were fully vaccinated. In the priority age group i.e., 60+ years, 16.5% were partially vaccinated and 14.5% were fully vaccinated.

REASONS FOR VACCINE HESITANCY IN PARTIALLY VACCINATED & UNVACCINATED POPULATION

Table 2 denotes the reported reasons for vaccine hesitancy in different age groups among partially vaccinated or unvaccinated individuals (n=4144). Evidently 66.6% of the participants gave 'no reason' for vaccine hesitancy. 18.2% of the study participants said that they were 'planning to get vaccinated' with 17.5% belonging to the '18-44 years' age group. Following that, the most common hesitancy reason reported in all age groups was being 'worried about side effects of vaccine/fear of death' at 9.2%.

Further segregating into age groups; 5.1% of individuals from '60+ years' age group said that they were 'worried about the side effects of vaccine' or had 'fear of death' as a result of taking COVID-19 vaccine. Invariably, 3.4% of the study participants from '45-59 years' age group and 0.7% from '18-44 years', age group gave the same reason for hesitancy. The study participants from the '60+ years' age group, reportedly gave 'multiple reasons' (1.2%) like, vulnerability due to 'old age', 'underlying illnesses' and 'co-morbid' for vaccine hesitancy in them. With this perception they had a fear that taking vaccine would create a threat to their lives. They also said that they were 'worried about side effects of vaccine' as it can be fatal to their lives. 1.7% of the participants from 60 & above age group also said they are old and hence do not need to take the COVID-19 vaccine. Apart from this, 0.5% of the participants from both age groups (45-59 years and 60+ years) said they are co-morbid and therefore can't take risk to get vaccinated. Also, 0.8% total study participants reported being 'unsure about vaccine safety/efficacy' (with 0.4% belonging to each groups i.e., '45-59 years' and '60+ years'). 0.8% of the total study participants reported other vaccine hesitancy reason of being suffering from 'underlying illnesses' with 0.3% from '45-59 years' of age group and 0.5% from the '60+ years group'.

DISCUSSION

The results of this study indicate that a major proportion of our study population has either received or is optimistic about vaccination; however, vaccine hesitancy is also prevalent among community members, especially in the elderly. The most common reasons for vaccine hesitancy reported in our study were being worried about vaccine side effects/fear of death, unsure about vaccine efficacy/safety, suffering from 'co-morbidity or underlying illnesses, preference for gaining natural immunity and being old. With about 60.4% of India's entire population vaccinated by May 2022,³⁶ the most prevalent causes of hesitance were similar to other studies published globally.^{37,38} In India, too, studies implicated that hesitancies were very common, resulting in a denial of COVID-19 vaccine acceptance. A study from the Tamil Nadu state of India also reported similar vaccine hesitancy, majorly categorised into four groups with findings like mistrust in the health system, less trust in the effectiveness of the COVID-19 vaccines, concerns regarding adverse effects of the vaccine and preference for

Table 1. Age-wise description of vaccination status of the study participants

Total population (N=12,812)				
Vaccination status	Eligible group			Total
Age group	18-44 years	45-59 years	60+ years	
Study participants eligible for COVID-19 vaccination				
No	0	0	0	9.9%* (1264)
Yes	52.4% (6716)	19.4% (2491)	18.3% (2341)	90.1% (11548)
Percentage of study participants who have received first dose (partially vaccinated)				
No	6.1% (781)	1.3% (163)	1.8% (230)	19.0% (2438)
Yes	46.3% (5935)	18.1% (2328)	16.5% (2111)	81.0% (10374)
Total	52.4% (6716)	19.4% (2491)	18.3% (2341)	100% (12812)
Percentage of study participants who have received a second dose (fully vaccinated)				
No	24.1% 3083	4.5% 580	3.8% (481)	42.2% (5408)
Yes	28.3% (3633)	14.9% (1911)	14.5% (1860)	57.8% (7404)
Total	52.4% (6716)	19.4% (2491)	18.3% (2341)	100% (12812)

* Non-eligible for vaccination (<18 years)

natural immunity compared to vaccines.³⁹ Another study from India reported COVID-19 vaccine hesitancies among common people leading to a denial of the COVID-19 vaccine uptake. In the study, the main reasons for hesitancy were post-vaccine scare of adverse health effects and acceptance of the misinformation spread by social media.⁴⁰ One study's findings on the elderly reported that the COVID-19 vaccine priority group was unsure about COVID-19 vaccines due to many reasons such as lack of knowledge, specific beliefs, and cognitive barriers like misconceptions related to virus, vaccine and infection.⁴¹ Our study also suggests similar findings in the elderly, especially in 60 years & above, having major hesitancies like being old and giving multiple reasons (health issue/being co-morbid) or underlying illnesses besides the most common worry about unknown side effects of vaccine/fear of death as well. The other reasons reportedly observed in all age groups were 'being unsure about vaccine safety/efficacy, building up natural immunity over COVID-19 vaccine, death and planning to get vaccinated. Thus, health education and promotion are immensely important for the young and elderly to tackle the persistent vaccine hesitancy obstacle.

The study findings also reveal the need for repeated sensitization of community members, especially by culturally aware trusted members. Another qualitative study from Gujarat stated that awareness of using regional language is essential to overcome hesitancies. The awareness driven by engaging young people and political leaders and using resources can effectively overcome the vaccine uptake barriers.⁴² Literature also suggests that interventions focusing on health promotion can be effective as it empowers indi-

viduals to make healthier choices and reduces their risk of disease and disability.^{42,43} A systematic review implied varied interventions such as multi-component and dialogue-based interventions as the most effective sensitisation.⁴⁴ A similar study to our intervention, involving different interventional ways such as incentive-based (non-financial), reminder/recall-based by using social media platforms and providing meals or goods to encourage vaccination.⁴⁵ Evans et al. also suggest behavioural sciences and social marketing as strategies that can be effectively employed to overcome vaccine hesitancy. It emphasises five primary strategies such as raising public awareness and health promotion in health care facilities through informational didactic videos, posters, and pamphlets explaining the benefits and safety, dispelling myths about the COVID-19 vaccine. Influencing people with the help of well-known personalities, vaccine promotion strategy, vaccine promotion strategy, and education delivered on TV, radio, and social media such as YouTube and Facebook were also suggested.^{46,47} Adopting a similar strategy, at the national level, INYAS (Indian National Young Academy of Sciences) launched a multipronged nationwide mass awareness campaign to burst myths about COVID-19 vaccination in regional languages to make the immunisation programme successful.⁴⁴

The Government of India has already adopted many similar strategies. Due to the regional language disparity in a huge country like India, it is important to address vaccine hesitancy locally with region-specific solution for bridging the gap to complete vaccine coverage.

The study has a few limitations. The study only had representation from two blocks of Pune due to financial and

other constraints. Future studies could look at larger demographic diversity and explore the link between age and vaccine hesitancy. Furthermore, the lack of logistic regression analysis is another limitation of our study.

CONCLUSIONS

A need for sustained intervention with a continuous flow of awareness, correct knowledge and monitoring can reduce the hesitations that are prevalent among the common people related to COVID-19 vaccination, for which these health workers, social activists or other influencers and local bodies should be rightly and repeatedly trained and employed. Therefore, healthcare workers working at the grassroots level can play a major role in circulating the right and authentic information and appropriate knowledge about COVID-19, its vaccine, and public health measures to be followed.

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AUTHORSHIP CONTRIBUTIONS

All authors contributed to the writing of the manuscript.

COMPETING INTERESTS

The authors completed the Unified Competing Interest form at <http://www.icmje.org/disclosure-of-interest/> (available upon request from the corresponding author), and declare no conflicts of interest.

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Table 2. Vaccine hesitancy reasons among partially vaccinated and unvaccinated study participants from the selected villages (N=4144)

Age (in years)	Worried about side effects/fear of death	Unsure about vaccine efficacy/safety	Underlying illnesses	Comorbidity	Natural immunity	Being old	Death	Multiple reasons	Planning to get vaccinated	No reason	Total
18-44	0.7%	0.4%	-	0.1%	0.3%	-	-	-	17.4%	55.5%	74.4%
45-59	3.4%	0.4%	0.3%	0.5%	0.1%	-	-	-	0.8%	8.5%	14.0%
60 & above	5.1%	-	0.5%	0.5%	0.0%	1.6%	0.1%	1.2%	-	2.6%	11.6%
Total	9.2%	0.8%	0.8%	1.1%	0.4%	1.6%	0.1%	1.2%	18.2%	66.6%	100%

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