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# COVID-19 vaccination: Knowledge and perception of beneficiaries at a tertiary care center in Haryana, India

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## ABSTRACT

### Introduction

COVID-19 is an infectious and contagious disease caused by the SARS-CoV-2 virus. Despite the availability of vaccines, there were reports of vaccine hesitancy among people, including healthcare workers. The study aims to assess the level of knowledge about vaccines available in India, the perception of people towards COVID-19 vaccine and the experiences of people who took the vaccine.

### Methods

The study was carried out over a period of four months from 15th July 2021 to 15th November 2021. The sample size taken was 500. It was an institution-based cross-sectional, non-interventional study carried out among the people visiting the COVID-19 vaccination centre. The data collected using self-administered questionnaire was analysed using descriptive statistics and nonparametric statistics in SPSS version 29.

### Results

It was observed that only 6.3% (30) participants had adequate knowledge about COVID-19 vaccination, and the majority (58.1%, 271) participants had poor knowledge. More than 60% of participants (61.6%, 294) reported having hesitancy to take up the COVID-19 vaccination. Besides hesitancy, many factors like access to vaccines, protection from COVID-19 disease, fear of increasing COVID-19 cases and deaths etc. were the facilitating factors reported by participants for COVID-19 vaccination uptake

### Conclusion

More than half (61.6%) of the participants reported hesitancy towards uptake of vaccination owing to various side effects. However, people also believed that vaccination could prevent the disease, and its free availability facilitated people to get vaccinated. Various barriers leading to vaccine hesitancy and facilitators for a vaccination program should be identified and addressed for the successful implementation of the program.


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## INTRODUCTION

COVID-19 is an infectious and contagious disease caused by the SARS-CoV-2 virus. It is a novel coronavirus disease, and the first case was reported from Wuhan province of China. Since its inception it spread all over the globe, affecting more than 175 million people and causing more than three million deaths globally (1). To date, COVID-19 has caused more than 7 million deaths globally and nearly 0.5 million deaths in India (2,3). Behavioral interventions like physical distancing, wearing a mask, avoiding closed spaces, and frequent hand washing and vaccination are the preventive strategies available for this disease.

In India, till 2021, three vaccines were given Emergency Use Authorization (EUA) status. These were Covishield, which is a patent of AstraZeneca and manufactured in India by Serum Institute of India, Covaxin, manufactured by Bharat Biotech Limited, and Sputnik V, which had been certified by the Russian Ministry of Health (4-6). The efficacy of these available vaccines ranges from 81% to over 90% (5,6).

Phase-wise vaccination was done in India, where in healthcare workers of all categories and defined frontline workers were vaccinated first, followed by vaccination for those above 60 years and 45 years with comorbidities, and later on for children 12 years and above (5,7). To date, more than 2 billion vaccine dosages have been administered in India (7).

Despite the availability of vaccines, there were reports of vaccine hesitancy among people, including healthcare workers (8-10). For vaccination programs to be successful, individual perceptions, differences and similarities should be appreciated. Concerns should be addressed to enhance the effective implementation of vaccination programs. A novel disease and newer vaccine, lack of previous experience, safety data and adverse events following immunization (AEFI) data, news and events reported in social media, constantly changing vaccination guidelines, and reports on side effects led to the aggravation of vaccine hesitancy (9,11,12). Vaccine hesitancy was reported in various studies conducted across different regions of the world (13-15).

The COVID-19 vaccination sessions were started at Kalpana Chawla Government Medical College, Karnal, a tertiary care center on 16th January 2021. Thousands of beneficiaries got vaccinated at this Covid-19 Vaccination Center (CVC). Various studies conducted in India and abroad capture the perception and hesitancy of people including healthcare workers regarding COVID-19 vaccines (16-19). However, there is limited literature regarding knowledge and perception of the COVID-19 vaccine among the general population.The current study was planned to know about the level of knowledge about vaccines available in India, the perception of people towards COVID-19 vaccine and the experiences of people about the vaccine among those who took the vaccine.

### Material and methods

*Study area, design and population*: It was an institution-based cross-sectional, non-interventional study carried out among the people visiting the COVID-19 vaccination centre at Kalpana Chawla GMC, Karnal, Haryana. The study participants were all those aged >18 years who had come for COVID-19 vaccination. The study was carried out over four months from 15th July 2021 to 15th November 2021

*Sample size:* Assuming that 50% of people coming for COVID-19 vaccination had adequate knowledge of vaccines and taking an absolute margin of error at 5% and at 95% confidence interval, the sample size calculated was 400 using the formula $4pd/d^2$ where 'p' is the prevalence of knowledge, 'q' is (1-p) and 'd' is the permissible absolute error. After adjusting for the non-response rate (10%), the final sample size taken was 500.

*Inclusion criteria*: All those above 18 years of age visiting the CVC at KCGMC, Karnal and willing to give written consent were included as participants in the study.

*Exclusion criteria:* People accompanying the vaccinee, individuals with a history of psychiatric morbidity , hearing impairment and those vaccinated people unwilling to give a written consent were excluded from the study.

*Study tool and Data Collection*

A pre-tested, semi-structured, self-administered questionnaire was used for data collection. It was available in both the Hindi and the English language. For those who were not able to understand the questions or were illiterate, one of the Co-PIs asked the questions in an interview format and recorded the responses.

The usual number of beneficiaries at CVC, KCGMC, Karnal ranged between 50-300 per day. For data collection, every tenth person was selected. If the 10th person did not consent to participation, the next (11th) person was enrolled and so on.The socio-demographic information and information about knowledge and perception of vaccine on various aspects of the COVID-19 vaccine among CVC attendees was obtained. Each question in the domain of knowledge had one correct

answer and one mark was awarded for each correct response. The knowledge domain had a total of eight questions. To assess the level of knowledge, scores were

converted to rounded-off percentages and were divided as follows: >80% of correct responses represented good knowledge, a score between 60-79% represented fair knowledge and a score <60% represented poor knowledge (20).

*Data analysis*

Data was entered in MS Excel and SPSS version 29 was used for data analysis. Frequency and percentages were presented for the categorial data and tables and graphs were used for data presentation as appropriate. A chi-square test was applied to test the association of participants' knowledge about the COVID-19 vaccine with the various socio-demographic characteristics. A p-value of <0.05 was considered statistically significant.

*Ethical considerations*

Prior approval was obtained from the Institutional Ethics Committee, KCGMC, Karnal. A written consent was obtained from all participants after they were informed about he purpose of this study. The identity of all the participants was kept confidential during analysis and in preparation of the final report.

## Results

The study was carried out at a COVID-19 vaccination center of a tertiary care institute and 477 participants' data were analyzed after data cleaning. There were 64.8% males and the rest were female participants. It was observed that most (39.4%) of the participants were in the age group of 18-30 years old, were educated up to secondary or higher secondary level (71.1%), and were involved in semi-skilled jobs (38.8%). The majority of the participants resided in urban areas (52.8%), practised Hindu religion (85.7%), and socio-economically belonged to the Above Poverty Line (APL) status (61.4%). [Table 1]

**Table 1: Socio-demographic Profile of the study participants**

| Variable | | Frequency (n=477) | Percentage |
|---|---|---|---|
| Age group | 18-30 | 188 | 39.4 |
| | 31-40 | 100 | 21 |
| | 41-50 | 67 | 14 |
| | 51-60 | 63 | 13.2 |
| | >60 | 59 | 12.4 |
| Gender | Male | 309 | 64.8 |
| | Female | 168 | 35.2 |
| Educational status | Illiterate | 19 | 4 |
| | Primary & Middle | 65 | 13.6 |
| | Secondary and higher secondary | 339 | 71.1 |
| | Graduate & Postgraduate | 54 | 11.3 |
| Occupation | Unemployed | 10 | 2.1 |
| | Housewife | 110 | 23.1 |
| | Retired/Student | 117 | 24.5 |
| | Unskilled worker | 34 | 7.1 |
| | Semi-skilled worker | 185 | 38.8 |
| | Skilled worker | 18 | 3.8 |
| | Professional | 3 | 0.6 |
| Socio-economic Status | APL | 293 | 61.4 |
| | BPL | 184 | 38.6 |
| Place of Residence | Urban | 252 | 52.8 |
| | Rural | 225 | 47.2 |
| Religion | Hindu | 409 | 85.7 |
| | Muslim | 6 | 1.3 |
| | Sikh | 62 | 13.0 |

19.7% of the study participants had ever tested positive for COVID-19 and 5% of them were hospitalized too. 21.8% of participants reported a close family member ever testing positive for COVID-19. The majority (83.2%) of the participants had come to take the second dose of COVID-19 vaccination. [Table-2]

**Table 2: Distribution of participants according to COVID-19 disease and vaccination history**

| Variable | | Frequency | Percentage |
|---|---|---|---|
| Ever tested positive for COVID-19 | Yes | 94 | 19.7 |
| | No | 383 | 80.3 |
| Ever hospitalized due to COVID-19 | Yes | 24 | 5 |
| | No | 453 | 95 |
| Close family member ever tested positive for/died of COVID-19 | Yes | 104 | 21.8 |
| | No | 373 | 78.2 |
| Vaccine dose | First | 67 | 14.1 |
| | Second | 397 | 83.2 |
| | Precautionary | 13 | 2.7 |

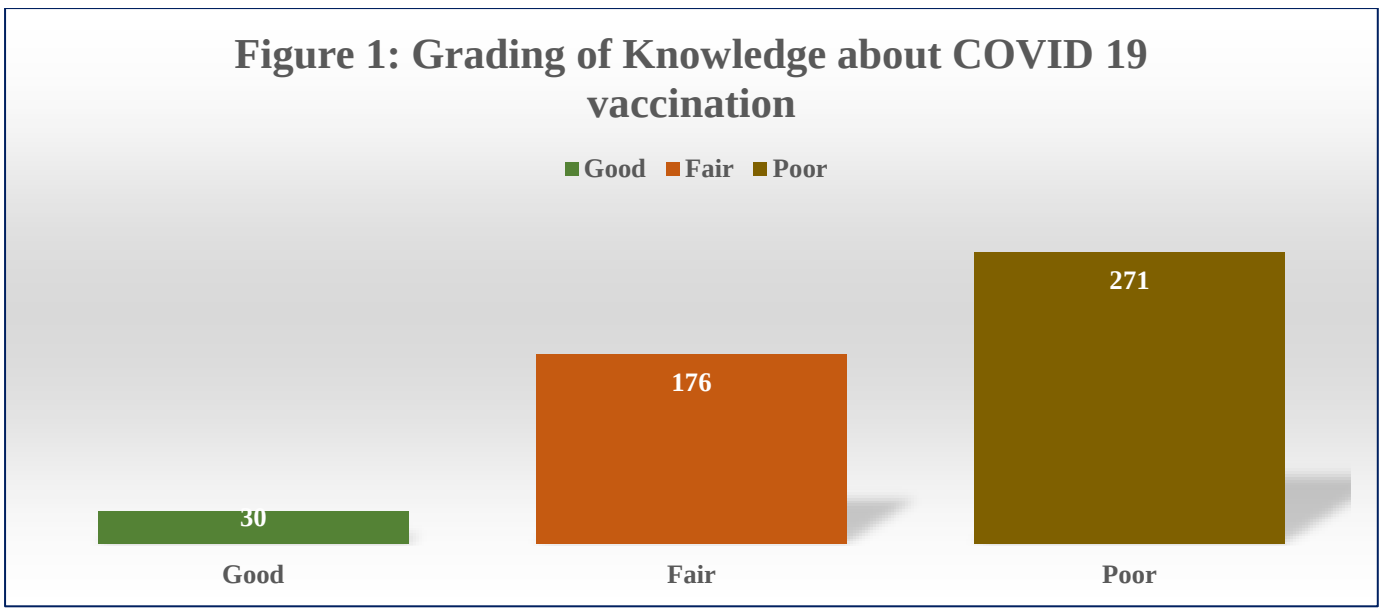
Knowledge of participants was assessed regarding the COVID-19 vaccination available in the country using a set of 8 questions derived from previous literature. Nearly 1/3rd of participants knew that 3 or more CVID-19 vaccines were approved in India at the time of the study and only 10% could name all three authorized vaccines. Only about one-third of the participants could name the CoWin portal available for registration of vaccination. A slightly more than half of the participants reported that COVID-19 vaccination can be given to pregnant and lactating women. [Table 3]

**Table 3: Distribution of participants according to knowledge about COVID-19 vaccination in India**
Knowledge domain Score: Total 8 questions

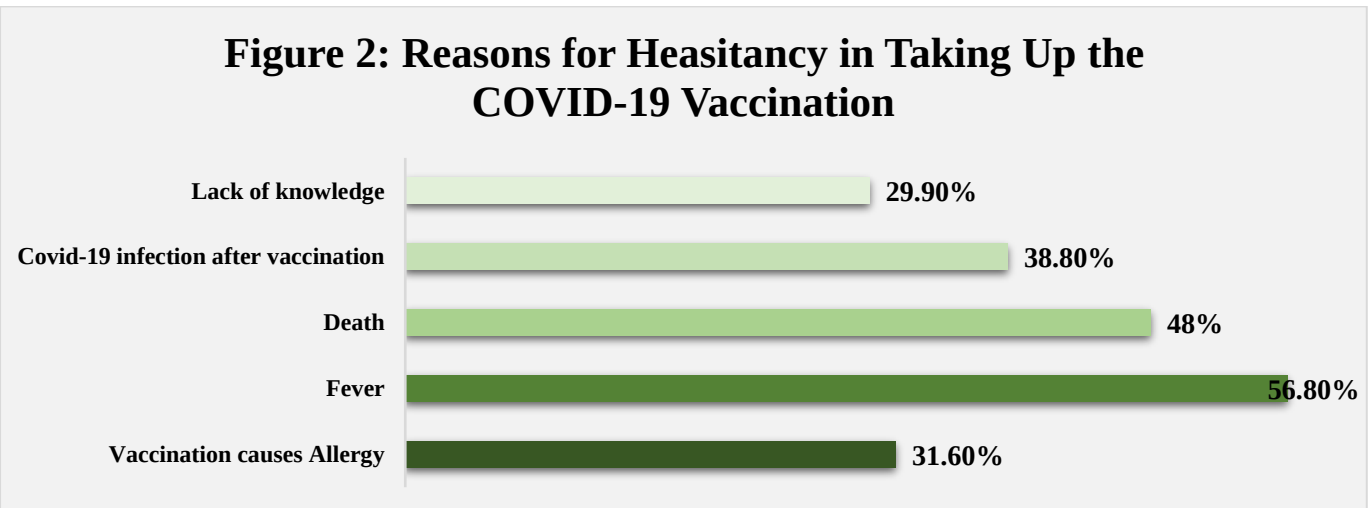
| Variable | | Frequency | Percentage |
|---|---|---|---|
| Vaccines against COVID-19 approved in India | 1 | 139 | 29.1 |
| | 2 | 195 | 40.9 |
| | 3 or more | 143 | 30 |
| Names of vaccine(s) against COVID 19 in India* | Covaxin | 90 | 18.7 |
| | Covishield | 81 | 17.1 |
| | Both Covaxin and Covishield | 188 | 39.4 |
| | Above + Sputnik | 48 | 10.1 |
| | Can't name | 70 | 14.7 |
| Is there any portal/ App available for vaccination registration | Yes | 350 | 73.4 |
| | No | 97 | 20.3 |
| | Don't know | 30 | 6.3 |
| Name of portal/ App available for vaccination registration (N=350) | Cowin | 116 | 33.1 |
| | Aarogyasetu | 56 | 16.0 |
| | Both | 31 | 8.9 |
| | Can't name | 147 | 42 |
| The interval (in days) between two doses of vaccine after an episode of COVID-19 | <30 | 47 | 9.9 |
| | 30 | 63 | 13.2 |
| | 84 | 112 | 23.5 |
| | 90 | 255 | 53.4 |
| Should precautions be followed after having vaccination for | Yes | 292 | 61.2 |
| | No | 165 | 34.6 |

| | | | |
|---|---|---|---|
| prevention against covid 19 | Don't know | 20 | 4.2 |
| Can the vaccine be given to pregnant women | Yes | 241 | 50.5 |
| | No | 175 | 36.7 |
| | Don't know | 61 | 12.8 |
| Can the vaccine be given to lactating women | Yes | 270 | 56.6 |
| | No | 172 | 36.1 |
| | Don't know | 35 | 7.3 |
| Can one get COVID-19 infection after covid 19 vaccination | Yes | 115 | 24.1 |
| | No | 356 | 74.6 |
| | Don't know | 6 | 1.3 |

Each correct response was awarded 1 mark and the overall score for each participant was calculated. Bloom's cut-off points (20) were followed to classify the participants as having good, fair, and poor knowledge of COVID-19 vaccines. It was observed that only 30 participants had good knowledge about the COVID-19 vaccine. [Figure 1]




It was observed that only 6.3% (30) participants had good knowledge about COVID-19 vaccination and the majority (58.1%, 271) participants had poor knowledge. [Figure 1]. More than 60% of participants (294, 61.6%) reported having hesitancy to take up the COVID-19 vaccination. The major reasons reported were fever, death and COVID-19 infection after vaccination among others. [Figure 2]





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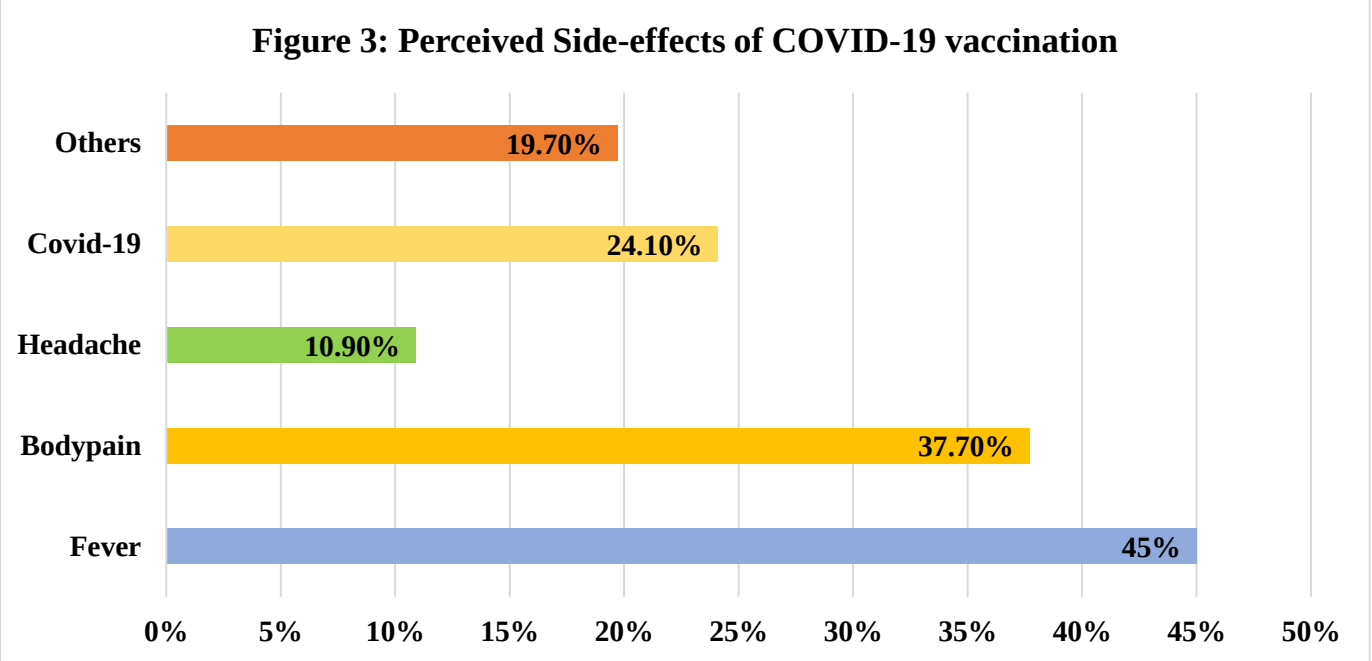
When the association of level of knowledge was assessed for various socio-demographic variables, it was observed that participants' age, education, history of having COVID-19 infection among self or relatives, history of hospitalization due to COVID-19 and any hesitancy to COVID-19 vaccination were the factors where the distribution had a statistically significant association. [Table 4]

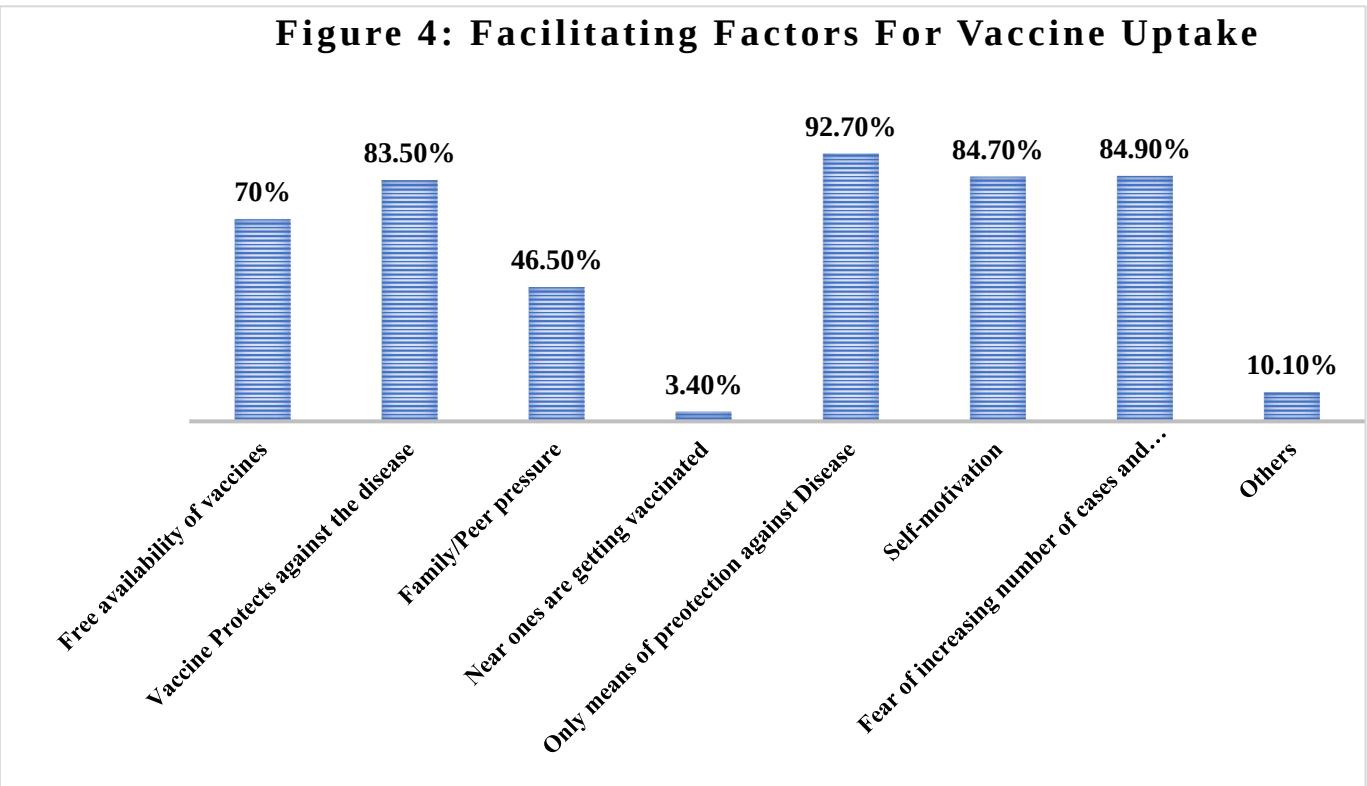
**Table 4: Distribution of participants as per the knowledge grade**

| Variable | Knowledge Grade | | | Chi-square test |
|---|---|---|---|---|
| | Good n (%) | Fair n (%) | Poor n (%) | |
| **Age (in years)** | | | | |
| 18-30 | 10 (33.3) | 71 (40.3) | 107 (39.5) | $\chi$2-17.625 |
| 31-40 | 5 (16.7) | 49 (27.8) | 46 (17) | p= 0.024* |
| 41-50 | 9 (30) | 16 (9.1) | 42 (15.5) | |
| 51-60 | 4 (13.3) | 21 (12) | 38 (14) | |
| >60 | 2 (6.7) | 19 (10.8) | 38 (14) | |
| **Gender** | | | | |
| Male | 17 (56.7) | 111 (63.1) | 181 (66.8) | $\chi$2-1.571 |
| Female | 13 (43.3) | 65 (36.9) | 90 (33.2) | p= 0.456 |
| **Education** | | | | |
| Illiterate | 0 (0.0) | 1 (0.6) | 16 (5.9) | $\chi$2-17.676 |
| Primary & Middle | 3 (10) | 29 (16.5) | 41 (15.1) | p= 0.007* |
| Secondary and higher secondary | 18 (60) | 128 (72.7) | 190 (70.1) | |
| Graduate & Postgraduate | 9 (30) | 18 (10.2) | 24 (8.9) | |
| **Socio Economic Status** | | | | |
| APL | 16 (53.3) | 105 (59.7) | 172 (63.5) | $\chi$2-1.538 |
| BPL | 14 (46.7) | 71 (40.3) | 99 (36.5) | p= 0.463 |
| **Ever Tested Positive** | | | | |
| Yes | 18 (60) | 56 (31.8) | 20 (7.4) | $\chi$2-73.121 |
| No | 12 (40) | 120 (68.2) | 251 (92.6) | p<0.001* |
| **Ever been hospitalized** | | | | |
| Yes | 18 (73.3) | 4 (75) | 2 (33.9) | $\chi$2-202.962 |
| No | 12 (26.7) | 172 (25) | 269 (66.1) | p<0.001* |
| **Close family member ever tested positive/died of COVID-19** | | | | |
| Yes | 17 (56.7) | 47 (26.7) | 40 (14.8) | $\chi$2-31.752 |
| No | 13 (43.3) | 129 (73.3) | 231 (85.2) | p<0.001* |
| **Any hesitation for COVID-19 vaccine** | | | | |
| Yes | 12 (40) | 92 (52.3) | 190 (70.1) | $\chi$2-20.695 |
| No | 18 (60) | 84 (47.7) | 81 (29.9) | p<0.001* |

Most of the participants reported fever as the most common side effect after injection followed by body pain. 19.7% reported vomiting, injection pain and giddiness as side effects after COVID-19 vaccination. [Figure 3]




Besides hesitancy, many factors like free availability of vaccines, protection from COVID-19 disease, fear of increasing COVID-19 cases and deaths etc. were the facilitating factors reported by participants for COVID-19 vaccination uptake. Some miscellaneous factors like the requirement of vaccination certificates and the requirement by the employer and workplace were also reported as facilitating factors for take-up of vaccination. [Figure 4]




Participants reported obtaining information about COVID-19 vaccination from diverse sources, including media, Government advertisements, friends/family, etc. [Table 5]


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**Table 5: Source(s) of information for COVID-19 vaccination**

| Source of Information | N (%) |
|---|---|
| TV/mass media | 182 (38.2) |
| Newspaper/print media | 211 (44.2) |
| Internet | 123 (25.8) |
| Government advertisement | 256 (53.7) |
| Family/friends | 248 (52) |
| Social media | 142 (29.8) |
| Social/religious groups | 9 (1.9) |

## Discussion

COVID-19 had devastating consequences on the economy and lives of people across the globe. With the spread of COVID-19, various nations initiated vaccine development to prevent it. Different vaccines were given emergency authorization in nations at different times. The vaccine introduction and uptake were associated with both hesitancy and welcome steps. Such diseases like COVID-19 taught public health that successful implementation of preventive strategies including vaccination requires knowledge and positive perception of people. The current study was conducted to assess the knowledge and to get people's perceptions of COVID-19 vaccination in a region of North India.

In the study, it was observed that very few (6.3%) participants had good knowledge regarding the COVID-19 vaccine based on a scoring system. The figures observed in the study are strikingly different from those reported by Venkataraman R et al (21). In their study, they reported that 81% of participants had adequate knowledge about the COVID-19 vaccine. This difference can be attributed to the fact that they had four questions and the current study utilized seven questions to assess participants' knowledge. Also, the role of individual behavior in reading and gainingthe knowledge available through various means must be considered in observing such a huge differences. Discordant results were also seen between the current study and a study done in Saudi Arabia by Al-Zalfawi SM et al (22). They had seven questions to assess the knowledge, and the adequate knowledge cut-off was more than 70%. The higher sample size and a reduced cut-off for adequate knowledge could have accounted for the difference in the two studies. Also, the studies have used different questions to assess the knowledge of participants which also may have led to the difference in scores. These findings reflect a need to have a standardized assessment of knowledge regarding vaccines to have effective comparisons across geographical boundaries.

The majority of the participants (~40%) reported that both Covaxin and Covishied were the available vaccines for COVID-19 prevention and only 10% of participants reported knowing that Sputnik V was also approved for use in India. More than half of the participants in the current study knew that precautions have to be observed even after COVID-19 vaccination and that the vaccine can be given to pregnant and lactating females (61.2%, 50.5%, and 56.6% respectively). Bibi A et al (23) in their study reported that only 23% of participants knew that the COVID-19 vaccine could be given to pregnant females. These findings could be attributed to differences in the information broadcasting systems and their uptake by the general population.

The good level of knowledge in the current study had a statistical association with younger age, higher educational status, history of COVID-19 infection/hospitalization in self or any family member and no hesitancy towards the COVID-19 vaccination. Gender was not found to be associated significantly with knowledge about the COVID-19 vaccination. Various aspects of knowledge were reported to be associated significantly with age in the study by Kumari A. et al (2021) (24). Gender was not reported to be significantly associated with knowledge about COVID-19 vaccination in the study by Venkataraman R et al (21). Knowledge was reported to be higher among females,

younger age groups and higher education levels in the study by Al-Zalfawi SM et al (22). A significant association between knowledge about COVID-19 vaccination and education, employment and education was reported by Bibi A et al (23). Females were reported to have higher knowledge than males in the study by Samanta S et al (25). These findings suggest that younger age groups and those having higher educational status have a greater desire and ease in the use of gadgets which help them remain updated on knowledge. The findings also suggest that females tend to adopt preventive behaviors and try to gain knowledge for the same.

In the current study, 61.6% of the participants reported hesitancy to take the COVID-19 vaccine. The common reasons cited were fever, death, COVID-19 infection and allergies that could happen after vaccination. The study by Kishore J et al (26) in New Delhi reported vaccine hesitancy among participants as 29.5%. 40.7% of participants reported hesitancy in taking up COVID-19 vaccination in the study done in Tamil Nadu by Danabal KGM et al (27). Side effects and concerns about availability were reported as major factors for vaccine hesitancy in the study by Kumari A et al (2021) (24) and Cascini F et al (28). The variation in reported figures in vaccine hesitancy may be due to differences in sample size and level of prevalent COVID-19 infection. Vaccine hesitancy is an important aspect of vaccination programs and has been rated as one of the top ten threats to global health by the WHO. It poses a significant challenge to the control efforts for infectious diseases in routine and during special situations like epidemics/pandemics. Governments and public health agencies have to look into and resolve the various context-specific barriers continuously to ensure the success of a vaccination program.

Free availability of vaccines, protection from COVID-19 disease, fear of increasing COVID-19 cases and deaths were reported as facilitators for taking up the COVID-19 vaccination in this study. Similar facilitators were observed in the study by Kumari A et al (24) and Taneja P et al (29) which is consistent with the findings of this study. Information obtained from government advertisements, Family and friends, the internet,and mass media was reported as the major sources of information about the COVID-19 vaccine in the current study. These were also listed as major information sources in the study by Kumari A. et al (24). In the era of digitalization, it is imperative to be dependent on the internet and mass media for information acquisition; however, many times the authenticity of the information provided is a matter of concern. False/misleading information may contribute to the unacceptance of vaccines or increase vaccine hesitancy, thus providing a setback to any vaccination program. So the concerned governments should have a check on the information provided through various means and also direct the social media and internet platforms to provide authentic information.

**Strengths and Limitations**

There is a paucity of data regarding community perception and knowledge of COVID-19 vaccines. This study adds to the existing literature and would help understand peoples' perceptions toward newer vaccine implementation. The study has also enumerated certain facilitators and factors causing vaccine hesitancy. These factors should be analyzed and considered during the implementation phase of vaccination programs for their success. The limitation of the current study is that the results cannot be generalized to the whole nation as the sample selected is not a truly representative sample of the national population.

**Conclusion**

In the current study, 6.3% of participants had good and about 37% had fair knowledge about the COVID-19 vaccination. These scores were influenced by age, education level and history of infection/hospitalization due to COVID-19. More than half (61.6%) of the participants reported hesitancy towards the uptake of vaccination owing to various side effects. However, people also believed that vaccination can prevent the disease and its free availability facilitated people to get vaccinated. Various barriers leading to vaccine hesitancy and facilitators for a vaccination program should be identified and addressed for the successful implementation of the program. More studies on COVID-19 vaccination and routine vaccination programs should be done to identify and rectify factors, inorder to enhance the successful implementation of vaccination program processes and prevent disease outbreak and severity.

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