

# Healthcare workers' perceptions and acceptance for COVID-19 vaccine for their children aged <18 years from the Region of Eastern Uttar Pradesh, India

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## ABSTRACT

**Background:** The coronavirus disease 2019 (COVID-19) vaccination program among adults in India is one of the highly successful vaccination drives globally, but the acceptance of the COVID-19 vaccine among parents for their children is largely unknown. As parents are primary decision-makers for their children, we aimed to assess parents' perceptions and acceptance for COVID-19 vaccination for children in India. **Aim:** To assess parental perceptions and acceptance for COVID-19 vaccination for their children (aged <18 years). **Materials and Methods:** A cross-sectional anonymous web-based survey was designed and conducted from November 1 to December 15, 2022. All the healthcare workers of a tertiary care institute in eastern Uttar Pradesh, having a child aged <18 years, constituted the study population and were invited. They were recruited through snowball sampling and were sent the study questionnaire in Google form through email and WhatsApp. Bivariate analysis was performed to determine the predictors of child vaccination acceptance among the parents. **Results:** A total of 388 healthcare worker parents (HCWPs) having a child <18 years of age completed the survey. The mean age of the parents was  $40.28 \pm 11.34$  years. The majority (96.9%) of them had already received the recommended two doses of the COVID-19 vaccine. Around 91% of the parents agreed that COVID-19 vaccines are important for children's health, whereas 89% agreed that COVID-19 vaccines are effective. A total of 356 (91.7%) parents were willing to vaccinate their children with a COVID-19 vaccine, of which 91.3% intended to do so as soon as possible. The factors significantly associated with the stated willingness for child vaccination among the participants were younger age ( $P = 0.008$ ), female gender ( $P = 0.000$ ), currently married status ( $P = 0.00001$ ), urban residence ( $P = 0.01$ ), lower monthly income ( $P = 0.03$ ), absence of any chronic illness ( $P = 0.0003$ ), history of COVID-19 in the child ( $P = 0.004$ ), and the child being up-to-date with the routine childhood vaccines ( $P = 0.01$ ). **Conclusion:** The HCWPs from eastern Uttar Pradesh, India, have a positive attitude and low vaccine hesitancy toward COVID-19 vaccination for children, with around 92% currently willing to vaccinate their children with COVID vaccine. Further longitudinal studies are required to assess the trend of parental acceptance of COVID vaccine.

**Keywords:** Children, COVID-19 vaccine, healthcare workers, parents, perception, willingness

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## Introduction

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by a novel virus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Most people infected with the virus experience mild to moderate respiratory illness and recover

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without requiring special treatment. However, some will become seriously ill and require medical attention. Older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, or cancer are more likely to develop serious illness.<sup>[1]</sup>

Globally, there have been more than 775 million confirmed cases of COVID-19, including ~7 million deaths, reported to World Health Organization (WHO) as of February 4, 2024.<sup>[2]</sup> India reported around 45 million confirmed cases and 0.53 million deaths due to COVID-19 as of February 4, 2024.<sup>[2]</sup> An effective strategy to combat the morbidity and mortality due to COVID-19 and to achieve higher population levels of immunity is development of an effective and safe vaccine for all populations, including children and adolescents. Since the initiation of nation-wide COVID-19 vaccination in India on January 16, 2021, the spread of the pandemic was halted and the number of COVID 19 cases and deaths were considerably reduced.

As per the available scientific evidence, children with COVID-19 have mild symptoms and are at lower risk of hospitalization and life-threatening complications of COVID-19.<sup>[3]</sup> Numerous public health authorities, including the WHO and United States' Centers for Disease Control and Prevention (CDC), advocate COVID-19 vaccine for children.<sup>[4,5]</sup> Although severe COVID-19 is somewhat rare in children and adolescents, vaccination of adolescents aged 12–18 years against COVID-19 has been found to be associated with a reduction in hospitalization COVID-19<sup>[6,7]</sup> and risk of multi-system inflammatory syndrome (MIS-C)<sup>[7-9]</sup> in this age group. A safe and effective COVID-19 vaccine tends to have both direct and indirect benefits.<sup>[10]</sup> COVID-19 vaccination is likely to provide many benefits simultaneously, such as reducing severe illness in children, resulting in fewer illnesses in families, normalizing the economy, reopening schools, reducing inequalities, and reducing stress.

Since early days of the pandemic, a large number of vaccines against COVID-19 were being developed globally.<sup>[11]</sup> In India, three vaccines, that is, Bharat Biotech's Covaxin, Cadila's Zycov-D, and Biological E Limited's Corbevax, have been granted emergency use authorization by the Drugs Controller General of India (DCGI) for use in children of different age groups.<sup>[12]</sup> The authorization was granted only after the vaccines were found to have adequate efficacy and safety profiles among children in the trials done with stringent criteria. In India, the vaccination of children aged 15–18 years was started from January 3, 2022 with Covaxin.<sup>[13]</sup>

Despite the success of adult COVID-19 vaccination globally, implementation of childhood COVID-19 immunization is faced with difficulties and is proving to be a big challenge for policymakers and healthcare managers. Including an effective and safe vaccine for children and a high level of vaccine acceptance among the parents or caregivers is also a key factor for global immunization success. WHO recommends that COVID-19 vaccines that have undergone clinical trials in children and

adolescents are safe and effective in preventing disease in children and adolescents.<sup>[4]</sup> However, the success of any vaccination program is heavily dependent on the acceptance of vaccines by the target population and is important for achieving herd immunity to halt the pandemic. WHO defines vaccine hesitancy as a delay in the acceptance or refusal of vaccination despite the availability of vaccination services. The WHO has designated it as one of the most critical challenges to public health at all times.<sup>[14,15]</sup> Vaccine-hesitant individuals may accept some of the vaccines while rejecting others, delay vaccinations, or accept vaccinations but still have concerns.<sup>[16]</sup> The causes of vaccine hesitancy vary across different countries and across the same country, which manifests the complex and context-specific nature of vaccine hesitancy and the factors influencing it and highlights the importance of locally identifying the pertinent contributory factors of vaccine hesitancy and designing tailored interventions to tackle these.<sup>[17]</sup>

Parents have the right to decide whether or not their children should be vaccinated against COVID-19. Therefore, it is important to understand parents' perceptions including attitude and willingness to get their children the COVID-19 vaccine. Studies from different countries around the globe show variable parental acceptance for the COVID 19 vaccination for children with most of them reporting a lower rate of acceptance.<sup>[18-28]</sup> In United States, it was less than 50% to as low as 6.7% in South Korea, whereas in UAE and China, it was as high as 75.1% and 92.7%, respectively.<sup>[18,22-24]</sup> A systematic review assessing barriers and facilitators of COVID-19 vaccination among children found that parents around the globe are hesitant to vaccinate their kids against COVID-19 and the spectrum of factors associated with vaccine hesitancy and uptake varies across the globe. The review concluded that local context is inevitable to take into account while developing programs to reduce vaccine hesitancy.<sup>[29]</sup> As the decision of vaccinating children lies with their parents or guardians, it is important to study their acceptance of and attitudes toward the COVID-19 vaccine and the factors that determine vaccine acceptance and hesitancy.

There have been very few studies from India and none from the state of Uttar Pradesh (U.P.), the largest state of India by population, assessing parents' acceptance of COVID-19 vaccines for their children. Furthermore, there is a dire need to devise strategies to address vaccine hesitancy among parents through the identification of attributing factors. With this background, the current study was aimed to assess the perception and willingness of healthcare workers to have their children a COVID-19 vaccine and to identify parental concerns about the vaccines. Additionally, we also explored the factors associated with willingness for vaccine uptake by the parents. The study was conducted at a time when the government health authorities were implementing vaccination for children aged 12 to 17 years in the country. The findings would be helpful in designing and implementing newer health interventions aimed at increasing parental acceptance of the COVID-19 vaccine for their children as well as filling in any existing knowledge gaps.

## Material and Methods

### Study design and population

This cross-sectional web-based survey was conducted from October 1, 2022 to November 30, 2022. The study population were the healthcare workers (HCWs) of Baba Raghav Das Medical College and Hospital, a tertiary care hospital in Gorakhpur, Eastern Uttar Pradesh (U.P.), who were parents of any child below the age of 18 years. The healthcare workers were of both genders, working in the institute and directly or indirectly involved in the patient care.

### Sample Size and sampling strategy

Assuming the maximum variability, which is equal to 50% ( $P = 0.5$ ) and taking 95% confidence level with  $\pm 5\%$  relative precision, the calculation for the required sample size was as follows:

So, using the formula  $n = z^2pq/(pl)^2$  and putting in values as  $p = 0.5$  and hence  $q = 1 - 0.5 = 0.5$ ,  $l = 0.05$ , and  $z = 1.96$ , the sample size came as 384. However, we intended to take around 400.

Snow ball sampling technique was used to recruit the participants. The directory of all healthcare workers was obtained from the Medical Superintendent's office, and the survey link was shared with the potential participants through WhatsApp and email.

### Study tools

A draft of the questionnaire was prepared based on a review of the relevant literature and reviewed by subject experts. The draft questionnaire was then pilot-tested on 50 participants and was adjusted for accuracy and clarity. The consistency and stability of the final questionnaire were tested using Cronbach's alpha, which was 0.82, denoting good internal consistency. The data of the piloted study were not included in the final analysis.

*Socio-demographic Measures:* The questionnaire has detailed information about the socio-demographic characteristics of study participants, including participant's age, sex, education level, place of residence, monthly income, occupation, and social status in the community.

*Parents confidence in COVID 19 vaccine:* Participants were required to answer ten questions related to their confidence in COVID-19 vaccines on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree). All questions were framed such that options 1 and 2 were regarded to denote as hesitancy and 3, 4, and 5 as non-hesitancy in our study. Vaccination in general was changed to COVID-19 vaccination in the original oxford vaccination hesitancy scale (VHS),<sup>[30]</sup> and all the negative statements in the original scale were converted to positive ones.

*Intent to Vaccinate the Child:* The survey asked, "Do you intend to vaccinate your child (ren) for COVID-19 if not vaccinated yet?"

The responses were captured in a 3-point Likert scale (Yes, No, and Not sure). We coded "Yes" as "Willing to get a COVID-19 vaccine for their child;" all others were labeled as "non-willing or hesitant". Those who have already got their children vaccinated with one or two doses of COVID vaccine were also labeled as "Willing".

### Data collection

The link of the Google form containing the survey questionnaire was distributed online through email and WhatsApp to the HCW parents and comprised mainly closed-ended questions designed to meet the study objectives. The questionnaire was prepared in both English and Hindi language in the Google forms. The questionnaire was translated from English to Hindi (local language) by a bilingual person to enable an easy understanding of the questions and avoid any questionnaire bias.

### Ethical considerations

The survey questionnaire started with a brief explanation of the study objectives and intent and a reminder to participants that their participation is entirely voluntary. Informed electronic consent was obtained from all the participants before filling out the survey perform. The confidentiality of data was well preserved throughout the study by keeping it anonymous and asking the participants to select honest answers and options. This study protocol was approved by the institutional Ethical Committee (IEC) of BRD Medical College, Gorakhpur, Uttar Pradesh, India vide letter no.- IEC/BRD/13/2022 dated 21/09/22.

### Statistical analysis

The responses received in Google forms were extracted into excel sheets. Data were analyzed using Statistical Package for Social Sciences, version 23.0 (SPSS, Inc., Chicago, IL, USA). Information related to parent's perspectives and their experiences toward COVID-19 vaccine was presented in descriptive statistics like frequency and percentage. Pearson's Chi-square test/Fischer's exact test was used to find the association between willingness of participants to get their child/children vaccinated as a dependent variable and related variables such as socio-demographic characteristics, COVID-19 infection, and vaccination history of participants as independent variables. A  $P$  value of less than 0.05 was considered as statistically significant.

## Results

A total of 388 healthcare worker parents (HCWPs) having one or more child <18 years of age completed the survey and constituted our study participants. Around half (46.4%) of them were aged 30–39 years, 60.8% were females, 88.6% were Hindu by religion, 97.9% were currently married, 54.6% were educated to graduate level or higher, 42.3% were OPD/Ward/Lab/Sanitary attendants, 70.1% had monthly income <50,000/- INR, 91.7% were not suffering from any chronic illness, 49.5% had a history of lab-confirmed COVID-19 diagnosis, and 96.9% of them had

received two or more doses of COVID-19. The primary source of information with regard to COVID-19 vaccines among the participants was workplace in 54.6% participants, followed by traditional media (25.8%) such as Newspaper, Television, and Radio. Around half (48.5%) of the participants were having only one child below 18 years of age with the majority of children being in the age group of 12–17 years (51.5%) and males (57.5%). A total of 10.3% of the participants gave a history of COVID-19 infection in their child/children, and 88.7% of them informed that their child/children is/are up-to-date with respect to the routine childhood vaccines. Their detailed characteristics are depicted in Table 1.

All the ten statements of VHS, modified as per the context of COVID-19 vaccines for children, were incorporated to measure the adequacy of attitudes toward the COVID-19 vaccine among the parents.

As depicted in Figure 1, more than 60% of parents have shown agreement with all the ten statements with more than 80% of the parents showing agreement with 9 out of the 10 statements, indicating a positive attitude and parental awareness of the COVID-19 vaccine's importance and benefits in children. More than 90% of parents stated that they would follow the experts' recommendations regarding vaccinating their children with COVID-19 vaccine. Nearly 90% of parents agreed that they trust and rely on information from the government vaccine program regarding COVID-19 vaccination in children, and a similar percentage of parents agreed that the COVID-19 vaccines were effective. Conversely, around 40% of parents displayed

their disagreement to the statement “COVID-19 vaccines doesn't carry more risks than other vaccines” and around 20% of them displayed disagreement with the statements “I don't think COVID-19 vaccines causes serious adverse effects” and “COVID-19 vaccines are needed though the COVID-19 is not common anymore”, which denotes the vaccine hesitancy among them.

A total of 356 (91.7%) participants showed willingness to vaccinate their child with COVID-19 vaccines, 16 (4.1%) refused for the same, and the remaining 16 (4.1%) were undecided regarding vaccinating their children. Out of the 356 participants showing willingness, 320 (89.9%) intended to get their child vaccinated as soon as possible, whereas 36 (10.1%) told that they would do as after some time only [Figure 2].

On bivariate analysis, the factors found to be significantly associated with the stated willingness for getting their children vaccinated with COVID-19 vaccine among the participants were younger age (18–39 years), female gender, currently married status, urban residence, lower monthly income (<10,000 INR), absence of any chronic illness in participant, history of any child testing positive for COVID-19, and history of completing immunization of the child/children with routine childhood vaccines [Table 2].

The reasons given by the participants who were non-willing to vaccinate their child/children with a COVID-19 vaccine are listed in Figure 3. The common reasons given were that there is lesser risk of infection to my child as community has acquired immunity

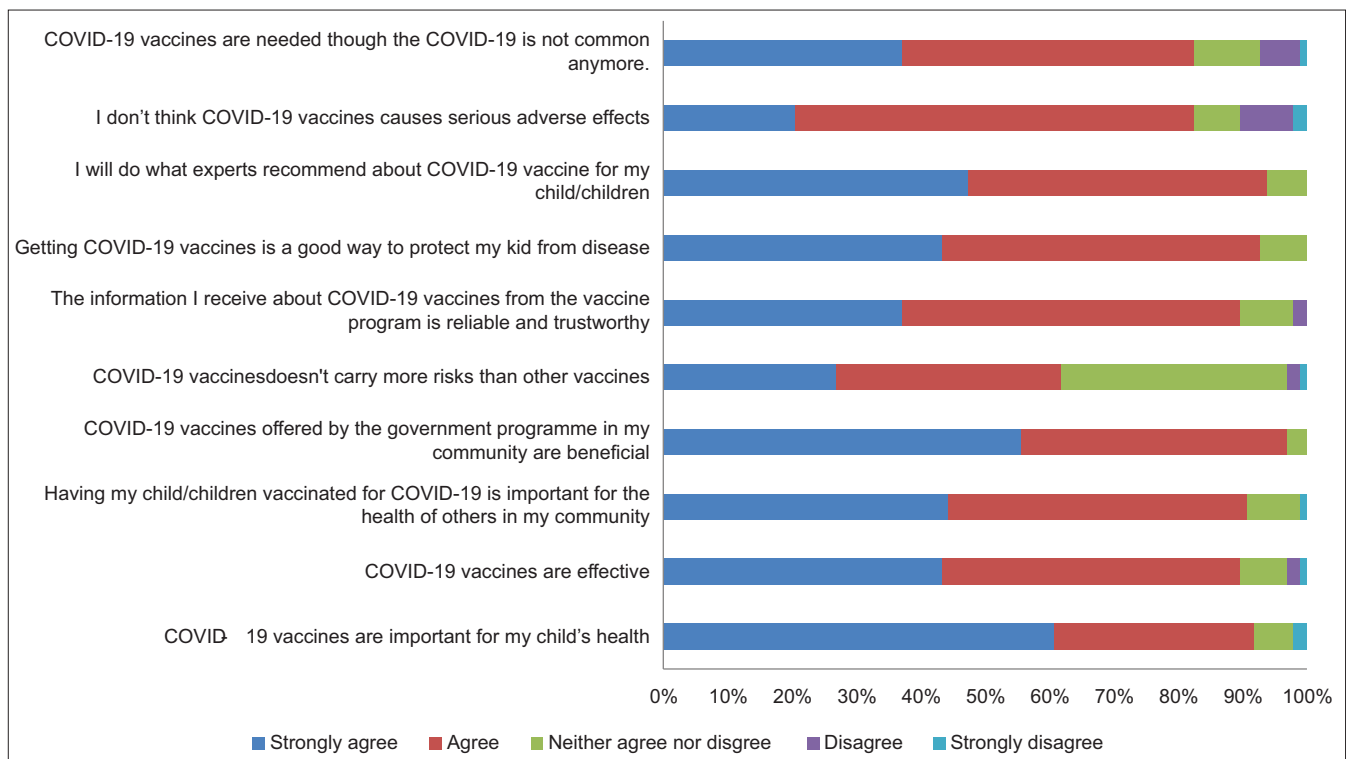


Figure 1: Parental attitude toward importance of vaccinating their children with COVID-19 vaccine

**Table 1: General characteristics of HCWPs and their children (n=388)**

Variables	Frequency (n)	Percentage
Age-groups (in years)		
18-29 years	04	1.0
30-39	180	46.4
40-49	172	44.3
50-59	24	6.3
≥60	08	2.0
Gender		
Male	152	39.2
Female	236	60.8
Religion		
Hindu	344	88.6
Muslim	24	6.2
Christian	12	3.1
Others	8	2.1
Marital status		
Currently married	380	97.9
Widowed/Divorced/Separated	08	2.1
Place of residence		
Urban	228	58.8
Rural	160	41.2
Highest level of Education		
Up to Matriculation	156	40.2
Intermediate (10+2)/Diploma	20	5.1
Graduate	108	26.8
Postgraduate and Above	104	27.8
Designation		
Doctor	124	32.0
Nursing officer/Technician	80	20.6
OPD/Ward/Lab/Sanitary attendant	164	42.3
Security staff	16	4.1
Monthly income (in INR)		
<10,000	164	42.3
10,000-49,999	108	27.8
50,000-99,999	40	10.3
≥100,000	76	19.6
History of any chronic illness		
Present	32	91.7
Absent	356	8.3
History of Lab confirmed COVID-19 infection		
Yes	192	49.5
No	196	51.5
History of Hospitalization due to COVID-19		
Yes	12	6.3
No	180	43.2
No history of COVID-19	196	51.5
COVID-19 Vaccination status		
Received 2 doses and 1 booster dose	292	75.3
Received 2 doses	84	21.6
Received 1 dose only	8	2.1
Not vaccinated	4	1.0
History of any adverse event post COVID-19 vaccine		
Present	124	31.9
Absent	264	68.1
Primary source of information for COVID-19 vaccine		
Workplace	212	54.6
Traditional media (TV, Radio, Newspaper)	100	25.8
Social and Online Media	64	16.5
Family and friends	12	3.1

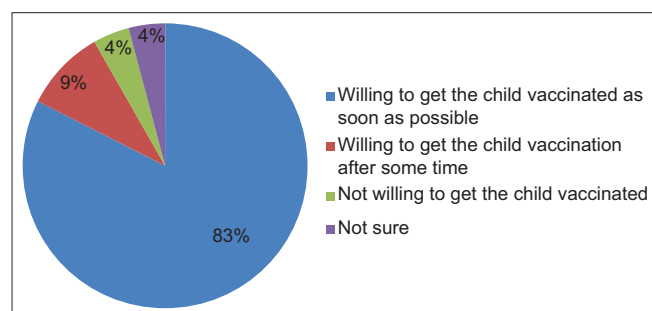
*Contd...*



Table 1: Contd...

Variables	Frequency (n)	Percentage
History of any child testing positive for COVID-19		
Present	40	10.3
Absent	348	89.7
Age-groups of the children (in years)		
12-17	312	51.5
<12	294	48.5
Gender of the children		
Male	346	57.1
Female	260	42.1
The child/children up-to-date with routine childhood vaccines		
Yes	344	88.7
No/Not sure	42	11.3

Vaccine Hesitancy Scale (VHS)—Attitude towards the Importance of Vaccinating Children against COVID-19



**Figure 2:** Willingness of the HCWPs to get their children vaccinated with COVID-19 vaccine (n = 388)

against COVID-19 (50.0%), the epidemic of COVID-19 has gone now (37.5%), sub-clinical infections have already imparted considerable immunity to my child (37.0%), COVID vaccines are not effective (25.0%), and concerns with the safety of vaccine in children (25.0%). A total of 4 (25.0%) participants gave no reason for their unwillingness.

## Discussion

Vaccination is a proven and one of the most cost-effective interventions for child survival.<sup>[31]</sup> The most important ingredient in all vaccines is trust,<sup>[32]</sup> and their public acceptance is critical for containing or ending any pandemic.<sup>[33]</sup> COVID-19 vaccine is the most powerful tool that we have in combating the battle against the COVID-19 pandemic, but vaccine hesitancy could be one of the greatest challenges in the battle against the COVID-19 by hindering the successful roll-out of COVID-19 vaccination among children. The vaccine refusal or hesitancy is driven by diverse factors in different countries or community groups.<sup>[34,35]</sup> During the COVID-19 pandemic, vaccine hesitancy has exhibited different phases, that is, Vaccine Eagerness, Vaccine Ignorance, Vaccine Resistance, Vaccine Confidence, Vaccine Complacency, and Vaccine Apathy, and has shown both temporal and spatial variation in these phases.<sup>[36]</sup>

In our study, around 97% of HCWPs had received the recommended two doses of COVID vaccines and around 75% of them had also taken the third dose, that is, booster dose of the vaccine. Only around 3% of the participants were found to

have self-COVID-19 vaccine hesitancy as compared to 15% of the health care workers in United States having hesitancy to get the COVID-19 vaccine.<sup>[37]</sup> In contrast to this, in a pan India study conducted among general population in early 2021, more than a fifth (20.63%) were either unaware of the COVID vaccine, more than a fourth (27%) were not sure if they will get the vaccine, and 10% indicated that they will refuse the vaccination.<sup>[38]</sup> The reason for this could be the difference in time periods and study populations in the two studies. Our study was done among HCWs who are undoubtedly having better knowledge and awareness of COVID-19 vaccines than the general population, and the former study was conducted in the early phase of the COVID-19 vaccine roll-out in the country when apprehensions regarding the new COVID-19 vaccines were much higher.

The majority (91.7%) of the parents in our study were willing to get their children vaccinated with a COVID vaccine with 83% of them intended to get their children vaccinated as early as possible. In contrast, a study by Padhi *et al.*<sup>[39]</sup> found only 33.5% of the Indian parents to be willing to get their child a COVID-19 vaccine. The later study was conducted before the introduction of COVID-19 for children in India, and the study participants were from the general population, whereas our study was conducted after the roll-out of COVID-19 vaccine for children and our study participants were only the healthcare workers. In a study by Mohan *et al.*,<sup>[40]</sup> the majority of the parents (85%) reported acceptance of the COVID-19 vaccine for children. Similarly, in a study by Sarkar *et al.*<sup>[41]</sup> among the HCWPs from southern India, 85.13% said they would vaccinate their children, 12.6% said they would not, and 2.2% said they were not sure, similar to our findings. In the same study, 97% of the HCWPs had completed their self COVID-19 vaccination, which is exactly the same as found in our study. Another study by Himanshi *et al.*<sup>[42]</sup> found the prevalence of COVID-19 vaccine hesitancy for children among the healthcare professionals to be only 3.3%. It is clearly evident from these findings that healthcare workers have much lower COVID-19 vaccine hesitancy for children compared to the general population. In a study by Yilmaz *et al.*<sup>[27]</sup> from Turkey, the only characteristic of either parents or children found to affect the parents' willingness for children to receive the COVID-19 vaccine was the parent being a healthcare worker.

**Table 2: Association of socio-demographic and medical characteristics of the participants and their children with their willingness to vaccinate their children with COVID-19 vaccine (n=388)**

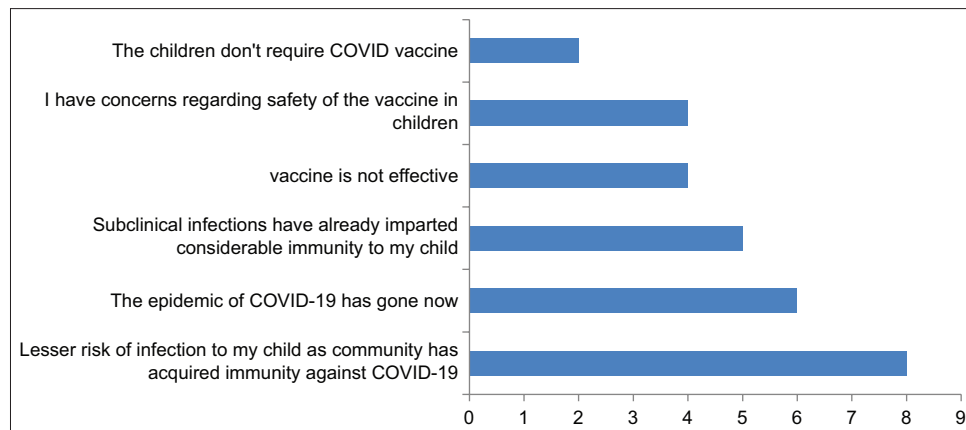
Variables	Willing to vaccinate the child n (%)	Not willing to vaccinate the child n (%)	Chi square-value	P
Age-group ( in years)				
18-39	176 (95.7)	8 (4.3)	7.03	0.008*
≥40 years	180 (88.2)	24 (11.8)		
Gender				
Male	128 (84.2)	24 (15.8)	18.8	0.00001*
Female	228 (96.6)	8 (3.4)		
Religion				
Hindu	316 (91.7)	28 (8.3)	0.004	0.83
Non-Hindu	40 (90.9)	4 (9.1)		
Marital status				
Currently married	352 (92.6)	28 (7.4)	18.8	0.00001*
Widowed/divorced/separated	4 (50.0)	4 (50.0)		
Education level				
Below graduate	164 (93.2)	12 (6.8)	0.86	0.35
Graduate and above	192 (90.6)	20 (9.4)		
Occupation				
Doctor	112 (90.3)	12 (9.7)	0.49	0.48
Nurse/Technician/Others	244 (92.4)	20 (7.6)		
Place of residence				
Urban	216 (94.7)	12 (5.3)	6.5	0.01*
Rural	140 (87.5)	20 (12.5)		
Monthly income (in INR)				
<10,000	156 (95.1)	8 (4.9)	4.26	0.03*
≥10,000	200 (89.3)	24 (11.7)		
Presence of any chronic illness in participant				
Yes	24 (75.0)	8 (25.0)	12.93	0.0003*
No	332 (93.2)	24 (6.8)		
History of Lab-confirmed COVID-19 in participant				
Present	172 (89.6)	20 (11.4)	2.36	0.12
Absent	184 (93.9)	12 (6.1)		
History of hospitalization due to COVID-19				
Present	12 (100.0)	0 (0.0)	-	0.7
Absent	344 (91.5)	32 (8.5)		
Self-COVID-19 vaccination status				
Taken 2 or more doses	344 (91.5)	32 (8.5)	-	0.7
Taken 1 dose only/not vaccinated	12 (100.0)	0 (0.0)		
History of any adverse event post COVID-19 vaccination				
Present	116 (93.5)	8 (6.5)	0.77	0.38
Absent	240 (90.9)	24 (8.1)		
History of any child testing positive for COVID-19				
Present	32 (80.0)	8 (20.0)	8.14	0.004*
Absent	324 (93.1)	24 (6.9)		
The child/ren up-to-date with routine childhood vaccines				
Yes	320 (93.0)	24 (7.0)	6.47	0.01*
No/Not sure	36 (81.8)	8 (18.2)		

\*Statistically significant

Vaccine hesitancy (VH) is highly context- and time-dependent. A survey on COVID-19 vaccine acceptance across 23 countries from June 29 to July 10, 2022 found willingness to accept vaccination at 79.1%, up 5.2% from June 2021. However, hesitancy increased in eight countries, ranging from 1.0% (United Kingdom) to 21.1% (South Africa). Overall support for vaccinating children under 18 years of age increased slightly but declined among parents who were personally hesitant.<sup>[43]</sup> Similarly, in a study from China comparing parents' COVID-19 VH before and after the roll-out of childhood COVID-19

vaccination, the prevalence of VH for children aged 3–11 years dropped from 25.9% to 17.4%, while such a prevalence of VH for children aged 12–17 years dropped from 26.0% to 3.5%.<sup>[44]</sup>

Factors found to be significantly associated with willingness to have their children receive a COVID-19 vaccine in our study were younger age of the parent (18–39 years), female parent, currently married status, urban residence, lower monthly income (<10,000 INR), absence of any chronic illness in the parent, history of any child testing positive for COVID-19, and the



**Figure 3:** Reasons given by the participants for their non-willingness for child vaccination for COVID-19 ( $n = 16$ )

child/children being up-to-date with mandatory childhood vaccines. In the study by Padhi *et al.*,<sup>[39]</sup> the expressed likelihood of child vaccination was greater among parents who had a bachelor's degree or higher education as well as among parents who intended to vaccinate themselves. However, in our study, parents' level of education as well as parents' COVID-19 vaccination status were not found to be associated with their willingness for their child's vaccination. However, a study by Shati *et al.*<sup>[45]</sup> from western Saudi Arabia found younger parents to have lesser vaccine hesitancy as compared to the older ones, which was also observed in our study.

Lesser risk of COVID-19 in children and pandemic of COVID-19 being over now were the common reasons given by parents who showed unwillingness for their child's COVID-19 vaccination. In the study by Sarkar *et al.*,<sup>[41]</sup> among the parents who were unwillingness for child vaccination, most parents felt COVID-19 is a mild illness in children and therefore do not require vaccination and the second most common cause was fear of adverse effects in their children, quite similar to our findings. Another study from Turkey reported that fear of adverse effects of vaccines is a significant driver of vaccine hesitancy among the parents.<sup>[46]</sup>

Acceptance of COVID-19 among parents for their children can also be improved using the previous experiences with other childhood vaccines. In India, the immunization program has made a few technology-dependent advancements. The Co-WIN platform, which served as the digital skeleton for India's COVID-19 vaccination program, is now moving to U-WIN (universal immunization), which is a comprehensive digital system aligned with the Ayushman Bharat Digital Mission. This integrated approach aims to strengthen the Universal Immunization Programme by leveraging digital technology. This integration of technology and health-care systems is a crucial step toward achieving universal immunization coverage in the country.<sup>[47]</sup>

### Strengths and limitations

The major strength of our study is that it is one of the few studies from India which assessed parental perception and acceptance

for childhood COVID-19 vaccination and the first study from Uttar Pradesh (U.P.), the largest state of country. It was carried out in the high-risk population of health care workers who were parents (HCWPs) of a child <18 years of age. However, it has certain limitations. The cross-sectional design of the study should be interpreted carefully when describing overall prevalence of vaccine hesitancy among parents in India and drawing any causal inferences. As it was an online survey, our sample only represented individuals with a smart phone and Internet access and having an email/WhatsApp account. Therefore, it may not be representing all the healthcare workers. Another limitation was being a single-center study and inability to collect responses from all participants and under representation of certain categories of healthcare workers such as nursing officers and technicians. There may be a possibility of recall bias affecting the validity of our study results as most of the information concerning the medical history and routine vaccination status of child was obtained from the participants based on their memory.

Despite the above limitations, our study was conducted at a critical time, when the COVID-19 pandemic is supposedly becoming less intense day by day and people and authorities both have become complacent. Our findings are reminiscent of the fact that although willingness for childhood COVID-19 vaccination among the HCWPs is high, it may not necessarily turn into action; that is, ultimately getting their children vaccinated and continuous campaigns to remove misconceptions toward COVID-19 vaccines for children are required. The study highlights the need for longitudinal studies to measure the acceptability of COVID-19 vaccines at different time intervals. Future studies are, thus, required to supplement our current findings to enhance COVID-19 vaccine uptake among children and adolescents in India.

### Conclusion

Acceptance for COVID-19 vaccination for children in our study population of HCWPs was found to be satisfactory and much higher compared to other previous studies. The majority of the HCWPs were having positive attitude toward the need and importance



of COVID-19 vaccine for children, although concerns over the vaccine efficacy and safety were shown by some parents. Our study provides insight into determinants of vaccine acceptance, vaccine hesitancy, and trusted sources of information that may be helpful to develop targeted interventions to increase childhood COVID-19 vaccination. Further longitudinal studies to assess the trend of parental acceptance and need for timely interventions for improving the coverage of COVID-19 vaccines among children are needed.

### Data availability statement

Data collected are available on reasonable request to the corresponding author (imback20006@yahoo.in). All the de-identified data are available for other research groups and public upon request to the corresponding author.

### Ethics statements

*Patient consent for publication:* Not applicable.

*Ethics approval:* This study involves human participants and was approved by Ethical Review Committee of BRD Medical College (Ref letter #: IEC/BRD/13/2022). Participants gave informed consent to participate in the study before answering the survey.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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