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Predictors of Parents' Willingness to Vaccinate Their Children Against COVID-19 in India: A Web-Based Cross-Sectional Survey

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Abstract

Background: Parents are more concerned about the available evidence of the safety, efficacy, and tolerability of the pediatric COVID-19 vaccine.

Aim: To assess the parents' willingness to vaccinate their children against COVID-19 and associate it with health belief model constructs.

Materials and Methods: A countrywide, online, self-administered, cross-sectional survey was conducted from December 15, 2021 to March 8, 2022. The HBM approach was used as a theoretical context to assess the predictors of parents' willingness to vaccinate their children against COVID-19.

Results: The majority (1,563; 95.4%) of parents are intended to immunize their children against COVID-19. Parent education, financial status, job, number of children, age-related vaccination status of the child, and household suffering from chronic disorders were significantly associated with a parent's willingness to recommend the COVID-19 vaccine for their children. The findings of HBM constructs indicated that perceived benefits (OR 14.222; 95% CI 7.192-28.124) of the COVID-19 vaccine in children, susceptibility (OR 7.758; 95% CI 3.508-17.155) of children toward COVID-19, and severity (OR 3.820; 95% CI 2.092-6.977) of COVID-19 infection in children were significantly associated with parent acceptance to vaccinate their children. Parents' higher perception of barriers (OR 0.609; 95% CI 0.372-0.999) to vaccination reduces the intention to vaccinate children against COVID-19.

Conclusion: The findings of our study reveal that the value of HBM constructs in the identification of predictors associated with the parents' willingness to encourage COVID-19 vaccine for their children. It is important to improve health and reduce the barriers to COVID-19 vaccination among Indian parents having children less than 18 years.

Keywords

COVID-19 vaccine, parent acceptance, health belief, HBM constructs, pediatric vaccine

Introduction

In the 21st century, the New Coronavirus 2019 (COVID-19) pandemic was a new public health challenge that led to a drastic loss of global health and the economy.[1] Vaccination is viewed as an important response in the fight against the COVID-19 pandemic. Global evidence shows that the COVID-19 vaccine has promising results in preventing the severity of illness, hospitalizations, and deaths, particularly among the geriatrics and immunocompromised.[2,3]

Vaccine hesitancy is a global concern with respect to vaccine coverage and public health during the COVID-19 pandemic.[4]

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Approximately 69.1% of the world's population is given at least one dose of COVID-19 vaccine. In low-income countries, only 25.9% of people are covered for at least one dose of COVID-19 vaccination.[5] Despite an adequate supply of vaccines, vaccine hesitancy contributes to low vaccine coverage in countries such as the United States and India.[6]

As of March 9, 2022, there were 448 313 293 confirmed cases of COVID-19, with 6 011 482 deaths globally.[7] In India, from January 3, 2020 to March 9, 2022, there were 42 975 883 confirmed COVID-19 cases and 515 355 deaths reported to the World Health Organization (WHO).[7] According to WHO global report, the rate of COVID-19 among children under age five, children ages 5 to 14, and young people aged 15 to 24 is only 2%, 7%, and 15% respectively. Similarly, COVID-19 deaths among children under the age of 14 represent just 0.1%.[8] However, there is a potential for a long-term complication called multisystem inflammatory syndrome in children who have recovered from COVID-19. MIS-C is a rare and serious condition that is associated with anasarca.[9] Children with underlying health problems (obesity, heart, kidney, or liver disease, asthma, cystic fibrosis, and cancer) are at higher risk to develop severe form of COVID-19.[10] Children are at risk of getting "long COVID-19" means long lasting symptoms (headache, and fatigue) from weeks to months. The latest research shows that COVID-19 vaccine protect the children from risk of getting sick, long COVID-19, and MIS-C.[11-13] Also the vaccine protects development of severe form of COVID-19 among children with underlying health problems.[14]

The Centre for Disease Control (CDC) and United Nations International Children's Emergency Fund (UNICEF), South Asia recommends COVID-19 vaccine for everyone ages 6 months and older, and COVID-19 boosters for everyone ages 5 years and older.[15,16] According to the CDC reports, millions of children aged between 5 and 17 years have already vaccinated for at least one dose. The safety of COVID-19 vaccine in US children was evaluated by three major adverse event monitoring systems, that include, v-safe (voluntary reporting via smart phone), Vaccine Adverse Event Reporting System (VAERS; voluntary reporting to USFDA and CDC), and Vaccine Safety Data (VSD) link (health record surveillance).[17] According to safety data generated by the vaccine safety data link, serious adverse events like myocarditis in 7 cases, and MIS-C in 5 cases were developed within 21 days after COVID-19 vaccination in 889 000 children. Under voluntary reporting via smart phone (v-safe) surveillance system, injection site reactions (55%), systemic reactions (32%), and hospitalization (0.02%) are reported after Pfizer-BioNTech to 49,396 children ages 5-11 years. The VAERS safety data on COVID-19 vaccine in children revealed that the risk of serious of adverse event like myocarditis was verified in 2.2 cases per 1 million doses. The data shows that only 251 serious adverse events were reported upon 18 182 496 COVID-19 vaccine doses in children age 5-11 years. As per the safety data synthesized by these three monitoring systems, the risk of serious adverse events upon COVID-19 vaccination in children is very rare. This favorable safety profile of COVID-19 vaccine needs to be shared to the parents to promote decision making process.

In January 2021, the Indian medicines regulatory authority approved emergency use authorization for ChAdOx1 nCoV-19 (Covishield vaccine, Serum Institute of India, Pune) and BBV152 (Covaxin, Bharat Biotech International, Hyderabad) vaccines. In phase one, the COVID-19 vaccination campaign was launched on January 16, 2021 for health care workers and front-line workers. In the second, third, fourth, and fifth phases the vaccination services were extended to elderly and comorbid people (March 1, 2021), individuals aged more than 45 years old (April 1, 2021), individuals aged more than 18 years (May 1, 2021), and children aged between 15 and 18 years old (January 3, 2022) respectively.

In India, the second wave of COVID-19 has been halted and it is anticipated that the third wave will affect the rest of the non-immune group, which includes children. The severity of the third wave among pediatric population is difficult to predict and to only one defense available is safe vaccination drive in children.[18] The American Academy of Pediatrics advises all children to receive the COVID-19 vaccine once it is available.[11] Pediatric COVID-19 vaccination is fundamentally dependent on the mindset and awareness of parents and caregivers about the anticipated third wave. Parents are fully entitled to make COVID-19 vaccination decisions for children. Evidence shows that factors such as parental education, the child's vaccination status and COVID-19 anxiety have significantly impacted parents' acceptance to vaccinate children against COVID-19. Parents' perception of the lack of safety and effectiveness of the COVID-19 vaccine for children is a major barrier to vaccination.[19-21]

The intention of parents to vaccinate children against COVID-19 and the exploration of parental factors are critical to implementing the vaccination campaign among children. The objective of this study is to assess the willingness of parents to vaccinate their children against COVID-19 and to associate willingness with the concepts of HBM like perceived susceptibility, severity, benefits, barriers and benefits of COVID-19 vaccination.[22]

Materials and Methods

Study Design and Ethical Considerations

This is a self-administered, cross-sectional online survey. Before initiating the survey, the Raghavendra Institute of Pharmaceutical Education and Research (RIPER) Institutional Review Board (IRB) approved (RIPER/IRB/PP/2021/010) the study protocol, survey tool, and informed consent process. This study was conducted online in accordance with the Declaration of Helsinki's guidelines for human subject research. Based on a review of the relevant literature, the questionnaire was created. It was then put to the test on 30 parents and fine-tuned for precision and clarity. Before proceeding to the survey link, all participants were given the opportunity to give their informed consent. No monetary incentive was provided to participants and anonymity was maintained to ensure confidentiality and reliability of the data.

Study Participants

The target study participants were Indian parents of children under the age of 18, irrespective of gender, aged between 18 and 70 years, and willing to participate in the study by opting "Yes" for the first question (Are you willing to join in this online survey?) were eligible in this study. Participants who did not complete the entire survey, as well as foreign nationals and parents with children over the age of 18, were omitted.

Sample Size and Sampling

The number of participants in this survey was determined using a single-population proportion formula. We estimated a sample size of 1,278 by assuming a vaccine acceptance rate of 50%, a margin of error of 2% (95% CI 48%-52%), a power of 80%, and a design impact of 1%. The final sample size is calculated to be 1,730 after allowing for a 20% non-response rate. Participants were recruited using a simplified snowball sampling technique, in which those who were invited to participate in the survey were asked to forward the invitation to their friends and family.

Survey Tool

There were Three components of the survey questionnaire: (1) demographics, perceived health state, and COVID-19 experience; (2) parents' intention to accept the COVID-19 vaccine among their children; (3) HBM hypotheses.

Demographics, Perceived Health Status, and COVID-19 Experience. Participants were requested to complete up the form with demographic information such as their age, gender, education, occupation, and monthly family income. The participants were also asked about their overall health, whether they had any chronic illnesses, and whether any of their friends, family members, neighbors, or coworkers had been infected with COVID-19.

Parents Intention to Accept the COVID-19 Vaccine among Their Children. On a five-point Likert scale ('strongly disagree = 1'/ 'agree = 2' /'neutral = 3' /'disagree = 4'/ and 'strongly disagree = 5'), the intention to accept COVID-19 vaccine in children was measured by asking a single itemized statement (If a vaccine against COVID-19 infection for children is available, I will get my children vaccinated). Later, each participant's response was divided into two categories: intended to take vaccine = 1 ('strongly agree' / 'agree') and not intended to take vaccine = 0 ('neutral'/'disagree'/'strongly disagree').

Health Belief Model Hypotheses. Using an HBM hypothetical approach, participants' beliefs about the COVID-19 vaccine were assessed. The HBM for the COVID-19 vaccine includes questions about perceived susceptibility to COVID-19 infection (four items), perceived severity of COVID-19 infection (five items), perceived benefits of COVID-19 vaccination (two items), perceived barriers to accepting the COVID-19 vaccine (five items), and cues to action (two items). In this HBM method, dichotomous responses such as 'agree'/'disagree' were utilized to get answers for each item.

Validation of Survey Tool

A well-designed and self-administered COVID-19 childhood vaccine survey form has been prepared and submitted for assessment of the validity and reliability of the content. Content validity was evaluated by a panel of experts comprising an epidemiologist, an infectious specialist, a vaccine research scientist, an anthropologist, and health officer. The survey instrument included a total of 16 questions (acceptance = 1, susceptibility = 3, severity = 4, benefits = 2, barriers = 3, and cues to action = 2 for COVID-19 vaccine). On a four-point Likert scale, experts' responses on the inclusion of each question or statement in the study tool were obtained, with scores of 1, 2, 3, and 4 representing strongly disagree, disagree, agree, and strongly agree, respectively. The values of scale-level content validity index (S-CVI) parameters, namely the S-CVI/average number and S-CVI/ utility agreement, were measured. The S-CVI/average number and S-CVI/utility agreement for vaccine acceptance (1, 1), susceptibility to infection (0.9, 1), severity of infection (0.9, 1), benefits of vaccination (0.9, 1), and barriers to vaccination (0.85, 1), and cues to action (0.9, 1) were estimated. The reliability test estimated a Cronbach's alpha coefficient of 0.80 for susceptibility to infection, 0.78 for the severity of infection, 0.76 for the benefits of vaccination, 0.80 for barriers to vaccination, and 0.78 for cue to action in a pilot sample survey, representing acceptable internal consistency.[23]

Data Collection

Data was obtained online using a Google Forms questionnaire or survey tool that included questions about demographics, COVID-19 experience, intention to receive a COVID-19 vaccine for their children and HBM constructs associated with COVID-19 vaccine in children. The survey tool was distributed through several messenger groups (Skype, WhatsApp, Hangouts, WeChat, and IMO) as well as social media platforms (Facebook, Twitter, Instagram, and LinkedIn) and mail groups. The survey's context, primary aims, and expected outcomes were all outlined on the first page of the form. To engage in the study, respondents had to answer yes to the first question (Are you willing to participate in this COVID-19 vaccination for children online survey?) The survey had a total of 1,641 responses. 1,638 replies remained after eliminating 3 incomplete responses.

Data Analysis

The data collected from respondents was analyzed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA). Prior to the beginning of the analysis in the Excel spreadsheet, the data was cleaned, sorted, and processed. Descriptive statistics like mean, SD, frequency, and proportion were used to represent the distribution of demographics, and HBM constructs among the study respondents. Binary logistic

Table 1. Demographics and COVID-19 Experience of Respondents ($n = 1,638$).

Variable	Frequency (%)
Parent age (years)	
<20	24 (1.5)
20-29	495 (30.2)
30-39	615 (37.5)
40-49	468 (28.6)
>50	36 (2.2)
Parent gender	
Male	798 (48.7)
Female	840 (51.3)
Parent education	
Illiterate	75 (4.6)
Primary school (1-5 Standard)	153 (9.3)
Middle school (5-8 Standard)	141 (8.6)
Secondary school (9 & 10 Standard)	273 (16.7)
Intermediate/post-high school diploma	579 (35.3)
Graduate/post-graduate/PhD	417 (25.5)
Parent occupation	
Professional and managerial	405 (24.7)
Semi-professional	231 (14.1)
Clerical/shop/farm	213 (13.0)
Skilled worker	213 (13.0)
Semi-skilled worker	84 (5.1)
Un-skilled worker	30 (1.8)
House wife/retired/unemployed	462 (28.2)
Profession	
Healthcare	345 (21.1)
Non-healthcare	1293 (78.9)
Monthly family income (USD)	
≤60.83	54 (3.3)
60.84-121.66	372 (22.7)
121.68-243.33	726 (44.3)
243.34-486.65	297 (18.1)
≥486.65	189 (11.5)
Number of children	
One	792 (48.4)
Two	807 (49.3)
Three	30 (1.8)
Four	9 (0.5)
Age of child	
1-6	756 (46.2)
7-12	579 (35.3)
13-18	303 (18.5)
Gender of child	
Male	810 (49.5)
Female	828 (50.5)
Any household members suffering with chronic diseases	
Yes	879 (53.7)
No	759 (46.3)
Are there any underlying diseases in your children?	
Yes	207 (12.6)
No	1431 (87.4)
Children received age-appropriate vaccinations	
Yes	1608 (98.2)
No	30 (1.8)
Any known person got infected with COVID-19	
Yes	1521 (92.9)
No	117 (7.1)
Do you believe social distancing can prevent COVID-19	
Agree	1590 (97.1)
Disagree	48 (2.9)
Do you believe wearing a mask decreases the risk of getting COVID-19	
Agree	1614 (98.5)
Disagree	24 (1.5)
Do you believe washing hands decreases the risk of getting COVID-19	
Agree	1581 (96.5)
Disagree	57 (3.5)

regression analysis was used to investigate the relationship between independent variables (demographics, COVID-19 experience, and HBM predictors) and the dependent variable (intention to vaccinate children for COVID-19). P value less than .05 was considered as a statistically significant value.

Results

Demographics

This online survey received responses from 1,638 people, with a response rate of 99.8%. The survey got responses from Indian parents with a wide range of demographics, including their level of education, occupation, and income. Majority of the respondents were between the ages of 40 and 49 years (468; 28.6%), females (840; 51.3%), parents pursuing or having completed graduation/post-graduation/PhD (417; 25.5%), professional or managerial level job (405; 24.7%), and family income between USD 243.34 and USD 486.65 (297; 18.1%). Only 207 (12.6%) of the parents reported underlying diseases in their children, and 1,608 (98.2%) of the children received age-appropriate vaccinations. More than half of the respondents (1,521; 92.9%) reported that a close relative (family member, friend, colleague, or neighbor) had been infected with COVID-19. Demographics, and COVID-19 experience of respondents ($n = 1,638$) were depicted in Table 1.

Health Beliefs

Majority (more than 90%) of the parents shown a perceived susceptibility, severity, benefits, and barriers toward COVID-19 vaccination in children. Less than one fourth of the respondents were agreed that they will vaccinate their children after getting

adequate information about COVID-19 vaccine and vaccination of many children. Distribution of the agreed parent responses of HBM constructs were represented in Table 2.

Parents Intention to Vaccinate Children Against COVID-19

Majority (1,563; 95.4%) of parents are willing to vaccinate their children against COVID-19. Very few (75; 4.6%) parents were not interested to recommend the COVID-19 vaccine in their children.

Association of Parent Characteristics with COVID-19 Vaccination in Children

Parents with no formal education (OR 0.310; 95% CI 0.14-0.69), or primary school (OR 0.439; 95% CI 0.217-0.888) were significantly not intended to vaccinate the children against COVID-19. Parents pursuing professional (2.033 (1.016-4.067), semi-professional jobs (OR 4.717; 95% CI 1.416-15.717), earning monthly income USD 121.68-243.33 (OR 3.595; 95% CI 1.761-7.341), having children one (OR 6.571; 95% CI 1.314-32.864) or two (OR 5.782 95% CI 1.162-28.778) were significantly associated with recommendation of COVID-19 vaccination in their children. Children received age appropriated vaccination were significantly associated to receive COVID-19 vaccination. Association of respondent characteristics, and COVID-19 experiences with intention to vaccination children against COVID-19 vaccine was represented in Table 3.

Table 2. Distribution of Agree Responses to HBM Constructs.

HBM constructs	Frequency (%)
Perceived susceptibility to get COVID-19 infection	
I worry a lot about getting COVID-19 in my children	1,602 (97.8)
My children are at high risk of getting COVID-19 in the next few months	1,440 (87.9)
Communicating with many people each day increases risk of getting the COVID 19 in my children	1,578 (96.3)
Perceived severity of COVID-19 infection	
If my children get COVID-19, they may become very sick	1,527 (93.2)
If I am infected with COVID-19, my children are at high risk of getting that infection	1,575 (96.2)
If my children get COVID-19 they are at risk of getting severe complications.	1,467 (89.60
I am terrified of getting COVID-19 vaccine to my children	1,464 (89.4)
Perceived benefits of COVID-19 vaccination	
Vaccination in children is a good idea because it makes me feel less worried about catching COVID-19 in my children	1,596 (97.4)
If my children receive the COVID-19 vaccine, they do not get very sick even after the infection	1,527 (93.2)
Perceived barriers to accept vaccine	
I am concern about having side-effects of the COVID-19 vaccine in my children	1,569 (95.8)
I am concern about the protective effects of the COVID-19 vaccine in my children	1,581 (96.5)
The novel CORONA virus vaccine will be more painful in children	1,500 (91.6)
Cues to action	
I will only vaccinate my children if the COVID-19 vaccine is taken by many children	360 (22.0)
I will only vaccinate my children if I was given adequate information about the COVID-19 vaccine	390 (23.8)

HBM: health belief model.

Association of HBM Constructs with COVID-19 Vaccination in Children

Three items in the HBM construct under perceived susceptibility, namely I worry a lot about getting COVID-19 in my children (OR 7.758; 95% CI 3.508-17.155), My children are at high risk of getting COVID-19 in the next few months (OR 6.657; 95% CI 4.104-10.798), and communicating with many people each day increase their risk of getting COVID-19 in my children (OR 6.012; 95% CI 3.043-11.878), were found to have a positive association to vaccinate children against COVID-19. Under perceived severity HBM construct, if my children get COVID-19, they may become very sick (OR 3.820; 95% CI 2.092-6.977), were found to have high significant odds of COVID-19 vaccine acceptance. Under perceived benefits of COVID-19 vaccination majority of the parents showed trust in vaccines. Parents who agreed that they will only vaccinate their children if it taken by many children (OR 0.546; 95% CI 0.333-0.895) and vaccinate their children only if adequate information about children COVID-19 vaccines is provided (OR 0.609; 95% CI 0.372-0.999) were shown a significant association with vaccine acceptance. Results of binary logistics regression analysis of HBM constructs with intention to vaccination children against COVID-19 vaccine were represented in Table 4.

Discussion

This is the first online cross-sectional survey conducted among Indian parents to assess their willingness to permit COVID-19 vaccination for their children. Since the approval of COVID-19 vaccine for children, a lot of misleading information was circulating in media that vaccine can cause long-term side effects like allergic reaction and infertility in future. Though the CDC report clearly reveals that there is no evidence on COVID-19 vaccine causes fertility problems, but public have misconceptions about the COVID-19 vaccination.[15] The current study aims to assess parents' acceptance rate of COVID-19 vaccine and explore the factors associated with parent acceptance by using a HBM approach. Evidence suggests that there was some hesitancy and a gap in the coverage of existing vaccines among India's general public.[24] The relationship between HBM constructs (susceptibility, severity, barriers to vaccination, vaccine benefits, and cues of action) and COVID-19 vaccine for children acceptance will provide

Table 3. Binary Logistics Regression Analysis of Parent Characteristics Associated With Intended to Recommend COVID-19 Vaccine to Their Children.

Variable	Frequency	Intended to vaccinate the children	*P* value	Odds ratio
Parent age				
<20	24 (1.5)	15 (62.50)	.040	0.269 (0.077-0.943)
20-29	495 (30.2)	480 (96.97)	.003	5.161 (1.761-15.127)
30-39	615 (37.5)	582 (94.63)	.042	2.845 (1.039-7.791)
40-49	468 (28.6)	455 (97.32)	.002	5.645 (1.891-16.852)
>50	36 (2.2)	31 (86.11)	Ref	Ref
Parent gender				
Male	798 (48.7)	795 (94.64)	Ref	Ref
Female	840 (51.3)	768 (96.24)	.124	0.690 (0.430-1.107)
Parent education				
Illiterate	75 (4.6)	65 (86.67)	.005	0.310 (0.138-0.697)
Primary school	153 (9.3)	138 (90.20)	.022	0.439 (0.217-0.888)
Middle school	141 (8.6)	138 (98.87)	.211	2.196 (0.640-7.535)
Secondary school	273 (16.7)	266 (97.44)	.185	1.814 (0.752-4.375)
Intermediate/post-high school diploma	579 (35.3)	558 (96.37)	.462	1.268 (0.673-2.391)
Graduate/post-graduate/PhD	417 (25.5)	398 (95.44)	Ref	Ref
Parent occupation				
Professional and managerial	405 (24.7)	393 (97.04)	.045	2.033 (1.016-4.067)
Semi-professional	231 (14.1)	228 (98.70)	.012	4.717 (1.416-15.717)
Clerical/shop/farm	213 (13.0)	201 (94.37)	.913	1.040 (0.516-2.094)
Skilled worker	213 (13.0)	204 (95.770	.386	1.407 (0.650-3.046)
Semi-skilled worker	84 (5.1)	81 (96.43)	.405	1.676 (0.497-5.655)
Un-skilled worker	30 (1.8)	21 (70.00)	<.001	0.145 (0.061-0.346)
House wife/retired/unemployed	462 (28.2)	435 (94.16)	Ref	Ref
Profession				
Healthcare	345 (21.1)	333 (96.52)	.273	1.421 (0.758-2.666)
Non-healthcare	1,293 (78.9)	1,230 (95.13)	Ref	Ref
Monthly family income (USD)				
≤60.83	54 (3.3)	45 (83.33)	.064	0.431 (0.177-1.049)
60.84-121.66	372 (22.7)	350 (94.09)	.363	1.371 (0.694-2.710)
121.68-243.33	726 (44.3)	709 (97.66)	<.001	3.595 (1.761-7.341)
243.34-486.65	297 (18.1)	285 (95.96)	.073	2.047 (0.937-4.476)
≥486.65	189 (11.5)	174 (92.06)	Ref	Ref
Number of children				
One	792 (48.4)	759 (95.83)	.022	6.571 (1.314-32.864)
Two	807 (49.3)	769 (95.29)	.032	5.782 (1.162-28.778)
Three	30 (1.8)	28 (98.33)	.202	4.000 (0.476-33.585)
Four	9 (0.5)	7 (77.78)	Ref	Ref
Age of youngest child				
1-6	756 (46.2)	719 (95.11)	.632	1.155 (0.640-2.085)
7-12	579 (35.3)	558 (96.37)	.172	1.579 (0.820-3.041)
13-18	303 (18.5)	286 (94.39	Ref	Ref
Gender of youngest child				
Male	810 (49.5)	793 (95.77)	Ref	Ref
Female	828 (50.5)	770 (95.06)	.492	1.177 (0.740-1.873)
Any household members suffering with chronic diseases				
Yes	879 (53.7)	827 (94.08)	.006	0.497 (0.301-0.820)
No	759 (46.3)	736 (96.97)	Ref	Ref
Are there any underlying diseases in your children?				
Yes	207 (12.6)	198 (95.65)	.865	1.064 (0.522-2.168)
No	1,431 (87.4)	1,365 (95.39)	Ref	Ref

(continued)

Table 3. (continued).

Variable	Frequency	Intended to vaccinate the children	*P* value	Odds ratio
Children received age-appropriate vaccinations				
Yes	1,608 (98.2)	1,545 (96.08)	<.001	16.349 (7.550-35.404)
No	30 (1.8)	18 (60.00)	Ref	Ref
Any known person got infected with COVID-19				
Yes	1,521 (92.9)	1,455 (95.66)	.099	1.837 (0.891-3.787)
No	117 (7.1)	108 (92.31)	Ref	Ref
Do you believe social distancing can prevent COVID-19				
Agree	1,590 (97.1)	1,527 (96.04)	<.001	8.079 (4.001-16.274)
Disagree	48 (2.9)	36 (75.00)	Ref	Ref
Do you believe wearing a mask decreases the risk of getting COVID-19				
Agree	1,614 (98.5)	1,551 (96.10)	<.001	24.619 (10.640-56.962)
Disagree	24 (1.5)	12 (50.00)	Ref	Ref
Do you believe washing hands decreases the risk of getting COVID-19				
Agree	1,581 (96.5)	1,521 (96.20)	<.001	9.054 (4.757-17.230)
Disagree	57 (3.5)	42 (73.68)	Ref	Ref

insights for developing policies or guidelines to improve vaccine coverage in the India.

The study reveals that, majority 1,563 (95.04%) of parents are willing to get vaccinate their children against COVID-19. Globally, the acceptance rate of pediatric vaccine is diverse, ranging from more than 90% in China, 52% in Mexico and Russia, 48.2% in England, and 1.6% in USA.[25-27] The wide variation in the pediatric vaccine acceptance rate between the countries may be due differences in the regulatory standards, previous experience of vaccine induced reactions, severity of the COVID-19 pandemic, and perception of the parents regarding pediatric vaccines. The current study showed a high acceptance rate comparing to other countries. In our study, the primary reason for accepting vaccination was to safeguard the child, whereas the two major reasons for rejecting immunization were fear of the vaccine's induced negative effects and quick launch of vaccine may be attributed with safety and quality concerns. An online survey conducted in the USA revealed that 80% of parents are willing to vaccinate their children against COVID-19 vaccine.[28] Majority of the parents in this survey are concerned about the safety, and trust of evidence available about children vaccine. As per the evidence generated from the safety surveillance system (v-safe, VAERS, and VSD) for COVID-19 vaccine, the risk of developing adverse effects like pericarditis, myocarditis, MIS-C, and other serious reactions are very rare with no evidence of causal relation between vaccine and the serious adverse effect.[15-17] The favorable safety profile of COVID-19 vaccine in children need to be shared to make definite decisions.

The findings of our study revealed that illiterate and lower socio-economic background parents shown vaccine hesitancy. Similar findings are also observed in a study conducted in South India.[29] This may be due to poor awareness about COVID-19 vaccine offered benefits and protection in the children. The evidence shows that COVID-19 vaccine can protect the children against MIS-C, long, and severe form of COVID-19.[10-13] There is a need to bring mindfulness among parents about the advantages presented by Coronavirus immunization in children.

Parent occupation, number of children, age related vaccination status of the child, and household suffering with chronic disorders were significantly associated with parent intention to recommend the COVID-19 vaccine for their children. Similar findings are also observed in studies conducted in Saudi Arabia, and South Korea.[30,31] The current study also revealed that the parents strictly adhere with COVID-19 preventive measures (handwash, social distance, and wearing mask) were significantly associated to vaccinate the children against COVID-19.

Health belief model (HBM) constructs like perceived susceptibility, severity, barriers to vaccination, vaccine benefits, and cues of action are important predictors than behavioral or demographic variables in vaccine acceptance decisions. The findings of the current study HBM constructs were significantly associated with parent vaccine acceptance. The findings of binary logistics regression analysis of HBM constructs indicated that perceived benefits of COVID-19 vaccine in children, susceptibility of children toward COVID-19, and severity of COVID-19 infection in children were significantly associated with parent acceptance to vaccinate children. Parents higher perception toward barriers to vaccination reduces the intention to children against COVID-19. Similar findings are also observed in a US-HBM study conducted among caregivers of children less than five years.[32] In our study, most parents believe that vaccinating children is a good idea because it helps them feel less concerned about their children getting COVID-19. According to the findings of the current survey, respondents are more concerned about the COVID-19 vaccine's

Table 4. Binary Logistics Regression Analysis of HBM Constructs Associated With Parents Intended to Recommend COVID-19 Vaccine to Their Children.

	Frequency (%)	Intended to vaccinate the children	*P* value	Odds ratio
Perceived susceptibility to get COVID-19 infection				
I worry a lot about getting COVID-19 in my children				
Agree	1,602 (97.8)	1,536 (95.88)	<.001	7.758 (3.508-17.155)
Disagree	36 (2.2)	27 (75.00)	Ref	Ref
My children are at high risk of getting COVID-19 in the next few months				
Agree	1,440 (87.9)	1,398 (97.08)	<.001	6.657 (4.104-10.798)
Disagree	198 (12.1)	165 (83.33)	Ref	Ref
Communicating with many people each day increases risk of getting the COVID 19 in my children				
Agree	1,578 (96.3)	1,515 (96.01)	<.001	6.012 (3.043-11.878)
Disagree	60 (3.7)	48 (80.00)	Ref	Ref
Perceived severity of COVID-19 infection				
If my children get COVID-19, they may become very sick				
Agree	1,527 (93.2)	1,467 (96.07)	<.001	3.820 (2.092-6.977)
Disagree	111 (6.8)	96 (86.49)	Ref	Ref
If I am infected with COVID-19, my children are at high risk of getting that infection				
Agree	1,575 (96.2)	1,506 (95.62)	.062	2.297 (0.958-5.512)
Disagree	63 (3.8)	57 (90.48)	Ref	Ref
If my children get COVID-19 they are at risk of getting severe complications.				
Agree	1,467 (89.60	1,420 (96.800	<.001	5.916 (3.594-9.739)
Disagree	171 (10.4)	143 (83.630	Ref	Ref
I am terrified of getting COVID-19 vaccine to my children				
Agree	174 (10.6)	153 (87.9)	Ref	Ref
Disagree	1,464 (89.4)	1,410 (96.31)	<.001	3.584 (2.108-6.094)
Perceived benefits of COVID-19 vaccination				
Vaccination in children is a good idea because it makes me feel less worried about catching COVID-19 in my children				
Agree	1,596 (97.4)	1,536 (96.24)	<.001	14.222 (7.192-28.124)
Disagree	42 (2.6)	27 (64.29)	Ref	Ref
If my children receive the COVID-19 vaccine, they do not get very sick even after the infection				
Agree	1,527 (93.2)	1,482 (97.05)	<.001	12.198 (7.301-20.379)
Disagree	111 (6.8)	81 (72.97)	Ref	Ref
Perceived barriers to accept vaccine				
I am concern about having side-effects of the COVID-19 vaccine in my children				
Agree	1,569 (95.8)	1,500 (95.60)	.102	2.070 (0.866-4.949)
Disagree	69 (4.2)	63 (91.30)	Ref	Ref
I am concern about the protective effects of the COVID-19 vaccine in my children				
Agree	1,581 (96.5)	1,509 (95.45)	.802	1.164 (0.356-3.814)
Disagree	57 (3.5)	54 (94.74)	Ref	Ref
The novel CORONA virus vaccine will be more painful in children				
Agree	1,500 (91.6)	1,431 (95.40)	.892	0.943 (0.402-2.212)
Disagree	138 (8.4)	132 (95.65)	Ref	Ref
Cues to action				
I will only vaccinate my children if the COVID-19 vaccine is taken by many children				
Agree	360 (22.0)	335 (93.06)	.016	0.546 (0.333-0.895)
Disagree	1,278 (78.0)	1,228 (96.09)	Ref	Ref
I will only vaccinate my children if I was given adequate information about the COVID-19 vaccine				
Agree	390 (23.8)	365 (93.59)	.049	0.609 (0.372-0.999)
Disagree	1,248 (76.2)	1,198 (95.99)	Ref	Ref

safety and efficacy than the cost of the vaccination. As a result, public health efforts aimed at promoting vaccine advantages and removing barriers are critical for increasing vaccine adoption. Healthcare interventions focusing on the identified HBM constructs in the survey helps in sensitizing the parents/caregivers to vaccinate their children against COVID-19.

Strengths and Limitations

The availability of COVID-19 vaccines and knowledge about these vaccines is growing rapidly, and people's opinions toward COVID-19 vaccination may alter as a result. Before evaluating the conclusions of this study, it is important to know limitations of the current study. First, because this survey was an online web-based survey, results from regions with limited access to social media and Internet capabilities may have been missed. Furthermore, poor members of society who do not own a Smart phone or laptop were excluded from our study sample, potentially resulting in coverage bias. Second, because this was not an interview-based study, respondents in the self-administered online questionnaire of HBM constructs and vaccine intention may have produced biased information. The online survey's voluntary nature may have resulted in selection bias, and respondents may not accurately represent the total population. Third, this online survey did not include respondents who were unable to understand English. The study's findings can only reflect the population at the time the survey was taken. Furthermore, because the impact of COVID-19 and healthcare system policies varies widely among nations, it is impossible to extrapolate the findings of this study to other regions of the globe. The strength of our study is we used an online survey with higher response rate and large sample size coverage.

Conclusion

This is the first study in India to assess parents' views on the usage of the COVID-19 vaccine for children**.** The study concludes that majority of the parents are willing to get their children COVID-19 vaccination. High intention to take COVID-19 vaccination is linked to HBM predictions like high perception of susceptibility to infection, severity of the condition, and likely vaccine benefits in children. The most popular reason for vaccination uptake was to protect children, to protect the family and to protect others from COVID-19 infection. This study sheds light on how Indian parents feel about the COVID-19 immunization for their children. In the future, our data could be used to develop a policy for childhood COVID-19 immunization. Vaccines for young children will very certainly become a requirement for reducing the pandemic's impact in schools. COVID-19 vaccine may also become a part of children vaccination schedules in the future. Understanding the views and intentions of parents of young children will allow public health officials and medical practitioners to plan vaccination campaigns before recommending immunizations for youngsters. Although it is important to vaccinate children in order to achieve herd immunity and reduce the severity of COVID-19, safety should be the most important element to address before the COVID-19 vaccine is carried out to younger children. Because of the immunogenicity profile and developmental stage of children, post-marketing vaccination safety surveillance should be conducted and maintained for a longer duration than in adults.

Abbreviations

CDC	Centre for Disease Control
UNICEF	United Nations International Children's Emergency Fund
HBM	Health Belief Model
RIPER	Raghavendra Institute of Pharmaceutical Education and Research
MIS-C	Multisystem Inflammatory syndrome in Children
VSD	Vaccine Safety Data
VAERS	Vaccine Adverse Event Reporting System
CVI	Content Validity Index
S-CVI	Scale level Content Validity Index.

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