

## A Cross-Sectional Study on COVID-19 Vaccine Acceptance and Hesitancy Among Rural Population of Chengalpattu District, Tamil Nadu

Rajeshkannan Sivakumar<sup>1</sup>, Raja T.K.<sup>2</sup>, M. Buvnesh Kumar<sup>3</sup>

<sup>1</sup>Associate Professor, Department of Community Medicine, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education

<sup>2</sup>Associate Professor, Department of Community Medicine, Shri Sathya Sai Medical College & Research Institute(SSSMCRI), Sri Balaji Vidyapeeth (Deemed to be University)

<sup>3</sup>Associate Professor, Department of Community Medicine, Saveetha Medical College, Saveetha Institute of Medical and Technical Sciences, Saveetha University

Received: 04-05-2023 / Revised: 05-06-2023 / Accepted: 01-07-2023

Corresponding author: Dr. M. Buvnesh Kumar

Conflict of interest: Nil

### Abstract:

**Background:** The global healthcare landscape has been reshaped by the emergence of COVID-19, necessitating efforts to contain its impact worldwide. India, a heavily populated nation, faced significant COVID-19 burden, prompting comprehensive strategies and vaccination campaigns. This study focuses on vaccine acceptance and hesitancy within India's rural population, aiming to understand factors influencing attitudes toward vaccination.

**Methods:** This three-month cross-sectional study (June-August 2021) at a tertiary care hospital's Department of General Medicine investigated COVID-19 vaccine acceptance and hesitancy in Chengalpattu's rural population. Ethical clearance was obtained, and a sample of 400 participants from 10 villages was selected using multi-stage stratified random sampling. Trained interviewers collected data using a culturally validated questionnaire, and SPSS 20.0 was used for analysis, including descriptive statistics, chi-square tests, and T-tests ( $p < 0.05$ ).

**Results:** The study's demographic analysis revealed 66.5% male and 33.5% female participants, with a mean age of 37.26 years. Vaccine acceptance among participants was observed in 73.2%, while 26.8% expressed vaccine hesitancy. Factors contributing to vaccine acceptance as 14.0% attributed it to advice from family/peers, 35.2% to healthcare worker (HCW) or leaders' recommendations, and 41.0% to awareness from social media/news. Males showed higher acceptance (75.1%) compared to females (24.9%,  $p < 0.0001$ ). Religion displayed significant differences, with vaccine acceptance highest among Hindus (79.4%) and lower among Muslims (6.1%) and others (4.8%,  $p = 0.004$ ).

**Conclusion:** Strategies focusing on accurate information dissemination, community engagement, and addressing socio-demographic disparities are crucial in ensuring equitable vaccine coverage.

**Keywords:** COVID-19, Vaccine Acceptance, Vaccine Hesitancy, Rural Population, Cross-Sectional.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

In recent times, the global healthcare landscape has been profoundly shaped by the emergence of the novel coronavirus disease (COVID-19) [1]. Since its onset, numerous efforts have been directed towards understanding, containing, and mitigating its impact on societies across the world [2]. With its highly contagious nature and severe health implications, COVID-19 has posed significant challenges to healthcare systems, economies, and daily life [3].

India, as one of the world's most populous countries, has witnessed a substantial burden of COVID-19 morbidity and mortality [4]. The virus has underscored the need for comprehensive strategies to combat its spread and manage its effects on public health. In response to this

challenge, the development and deployment of COVID-19 vaccines emerged as a pivotal tool to curtail the virus's transmission and reduce its severe outcomes [5].

India swiftly embarked on an ambitious vaccination campaign to achieve widespread immunization coverage and mitigate the impact of COVID-19. The campaign aimed to vaccinate a significant proportion of the population to establish herd immunity and alleviate the strain on healthcare resources [6,7]. The government, in collaboration with global health organizations and vaccine manufacturers, rolled out multiple vaccines that underwent rigorous testing and received emergency use authorization [8,9].

While urban areas initially received significant attention in terms of vaccine distribution and awareness campaigns, reaching rural populations with limited access to healthcare infrastructure presented unique challenges [10,11]. The vaccine rollout necessitated strategic planning to ensure equitable coverage across all regions, including rural communities. Ensuring vaccine acceptance among these diverse segments of the population became a critical component of the campaign's success [12,13,14].

Against this backdrop, this cross-sectional study seeks to investigate COVID-19 vaccine acceptance and hesitancy among the rural population in India. By delving into the factors that influence these attitudes, the study aims to contribute to a comprehensive understanding of the dynamics that shape vaccination behaviors in rural settings. This study employs quantitative surveys, to capture both quantitative data on vaccine acceptance rates and insights into the underlying reasons behind hesitancy. Analyzing the coverage and impact of the vaccination campaign within rural communities will provide insights into the effectiveness of current strategies and offer recommendations for optimizing future efforts.

## Materials and Methods

### Study Design

This cross-sectional study was conducted under the Department of General Medicine of a tertiary care hospital, spanning a duration of three months from June 2021 to August 2021. The study aimed to comprehensively investigate the patterns of COVID-19 vaccine acceptance and hesitancy among individuals from rural areas in Chengalpattu. Chengalpattu District was selected as the study setting due to its predominantly rural demographic and diverse socio-economic backgrounds. Ethical clearance was diligently obtained from the Institutional Review Board prior to the commencement of any data collection activities.

### Sample Size and Selection

The sample size was calculated (n=400) using a confidence level of 95%, a margin of error of 5%, and an estimated vaccine acceptance rate of 50% assuming limited number of studies being done in Tamil Nadu regarding vaccine acceptance among rural population. A total of 400 participants were recruited from 10 villages within Chengalpattu District using a multi-stage stratified random sampling technique. In the first stage, villages were

stratified based on geographical regions. In the second stage, households were randomly selected from each village using a systematic random sampling approach. Within each household, eligible participants aged 18 years and above were invited to participate.

### Data Collection

Data collection was carried out using a structured questionnaire that was developed based on a review of existing literature and expert input. The questionnaire underwent rigorous pilot testing to ensure its clarity, appropriateness, and validity within the cultural and linguistic context. Trained medical personnel proficient in the local languages conducted face-to-face interviews with the respondents. Special attention was given to accommodate varying literacy levels, making the survey accessible and understandable. The survey encompassed a wide spectrum of aspects including age, gender, education level, occupation, household income, and access to healthcare facilities, levels of vaccine-related knowledge, prevailing attitudes, existing beliefs, and primary sources of information.

### Data Analysis

Data were entered into a computerized database and analyzed using SPSS 20.0. Descriptive statistics, including frequencies and proportions, were used to summarize socio-demographic characteristics and vaccine acceptance rates. Chi-square tests and students T-tests were performed to elucidate the association between various variables and vaccine hesitancy and p value of <0.05 was considered significant.

### Results

In present a total of 400 study participants were enrolled. The study's demographic analysis revealed 66.5% male and 33.5% female participants, with a mean age of 37.26 years. Among respondents, 86.5% identified as Hindu, 9.0% as Muslim, and 4.5% with other affiliations. In terms of socioeconomic status, 35.8% were upper class, 35.0% upper and lower middle class, and 29.3% upper lower and lower class. Education levels varied: 12.9% illiterate, 21.7% primary/middle school, 24.1% high school/secondary school, and 41.3% graduate or higher. Regarding COVID-19, 24.6% had a history of infection, while 75.4% did not. Comorbid conditions were reported at 11.3% for diabetes mellitus and 16.5% for hypertension (Table 1).

**Table 1: Baseline characteristics of the study participants (N=400)**

Variables	Frequency	%
<b>Gender</b>		
Male	266	66.5
Female	134	33.5
Mean age (in years)	37.26±18.54	
<b>Religion</b>		
Hindu	346	86.5
Muslim	36	9.0
Others	18	4.5
<b>Socioeconomic status</b>		
Upper class	143	35.8
Upper and Lower middle	140	35.0
Upper lower and Lower	117	29.3
<b>Education</b>		
Illiterate	51	12.9
Primary/Middle school	87	21.7
High school/Secondary school	97	24.1
Graduate and above	165	41.3
<b>History of COVID-19</b>		
Yes	98	24.6
No	302	75.4
<b>Comorbid conditions*</b>		
Diabetes Mellitus	45	11.3
Hypertension	66	16.5

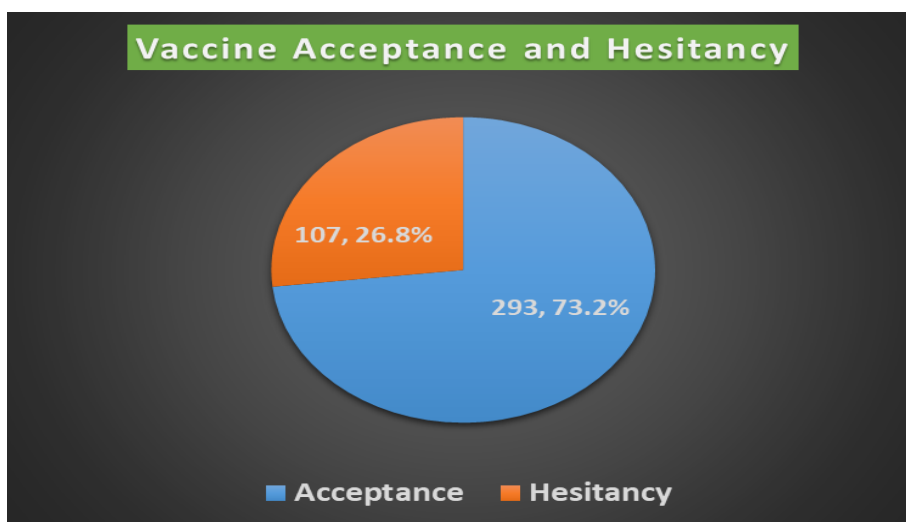
\*Multiple response

Participants' awareness of the COVID-19 vaccine was distributed as follows: 79.3% were informed, while 20.7% remained unaware. Among those aware, information sources included: family (40.4%), peers (30.6%), healthcare workers (ANM/Nurse/Doctor) (38.8%), religious/political leaders (5.7%), social media (6.0%), and news outlets (TV/Radio/Print) (19.9%) (Table 2).

**Table 2: Awareness of COVID-19 vaccine among study participants (N=400)**

Variables	Frequency	%
<b>Aware of COVID-19 vaccine</b>		
Yes	317	79.3
No	83	20.7
<b>Source of Information (n=317)*</b>		
Family	128	40.4
Peers	97	30.6
Health care worker (ANM/Nurse/Doctor)	123	38.8
Leaders (Religious/Political)	18	5.7
Social media	19	6.0
News (TV/Radio/Print)	63	19.9

Vaccine acceptance among participants was observed in 73.2%, while 26.8% expressed vaccine hesitancy. These statistics reflect the varying inclinations towards COVID-19 vaccination within the studied rural population (Figure 1).



**Figure 1: Vaccine Acceptance and Hesitancy for among study participants (N=400)**

Factors contributing to vaccine acceptance were diverse: 14.0% attributed it to advice from family/peers, 35.2% to healthcare worker (HCW) or leaders' recommendations, and 41.0% to awareness from social media/news. Additionally, 31.1% expressed acceptance due to fear of contracting the disease, 4.1% due to exposure from the unvaccinated, and 5.1% due to vaccine availability. Employers' instructions influenced 7.8%, while 5.1% cited tour/travel reasons (Table 3).

**Table 3: Reasons for the Acceptance for COVID-19 Vaccine (N=293)**

Acceptance*	Frequency	%
Advice from Family/peers	41	14.0
Advice from HCW/Leaders	103	35.2
Awareness from social media/News	120	41.0
Fear of contracting disease	91	31.1
Exposure from the unvaccinated	12	4.1
Vaccine availability	15	5.1
Employers' instructions	23	7.8
Tour/Travel reasons	15	5.1

\*Multiple response, HCW: Health care worker

Vaccine hesitancy was influenced by various factors: 72.9% cited lack of knowledge, 23.4% expressed safety concerns, and 20.6% reported insufficient information on the vaccination process. Additionally, 17.8% perceived low risk or need, while 28.0% indicated vaccine availability or access barriers. External influences played a role for 6.5%, and specific health conditions were a concern for 8.4% (Table 4).

**Table 4: Reasons (Components wise) for the Hesitancy for COVID-19 Vaccine among study participants (N=107)**

Hesitancy*	Frequency	%
Lack of Knowledge	78	72.9
Safety Concerns	25	23.4
Lack of Information on Vaccination Process	22	20.6
Perceived Low Risk or Need	19	17.8
Vaccine Availability/Barriers to Access	30	28.0
External Influences	7	6.5
Specific Health Conditions	9	8.4

\*Multiple response

The study's results illuminate noteworthy associations between demographic variables and COVID-19 vaccine acceptance and hesitancy in rural India. Males showed higher acceptance (75.1%) compared to females (24.9%,  $p < 0.0001$ ). Religion displayed significant differences, with vaccine acceptance highest among Hindus (79.4%) and lower among Muslims (6.1%) and others (4.8%,  $p = 0.004$ ). Socioeconomic status revealed

disparities, favoring the upper class (44.0%,  $p < 0.0001$ ). Education followed a similar pattern, with higher acceptance among those with graduate degrees (48.1%,  $p < 0.0001$ ). Notably, family and healthcare workers were influential information sources for vaccine acceptance ( $p < 0.0001$  and  $p = 0.003$ , respectively). History of COVID-19 and awareness of the vaccine were significantly associated ( $p = 0.01$  and  $p < 0.0001$ ). These findings

underscore the intricate interplay of demographics and information sources in shaping vaccine

attitudes among rural residents (Table 5).

**Table 5: Association of baseline characteristics with the COVID-19 vaccine hesitancy among study participants (N=400)**

Variables	Vaccine hesitancy		Vaccine acceptance		P value
	Frequency	%	Frequency	%	
Gender					
Male	46	43.0	220	75.1	<0.0001
Female	61	57.0	73	24.9	
Mean age (in years)	38.34±22.26		36.77±16.87		0.451
Religion					
Hindu	85	79.4	261	89.1	0.004
Muslim	18	16.8	18	6.1	
Others	4	3.7	14	4.8	
Socioeconomic status					
Upper class	14	13.1	129	44.0	<0.0001
Upper and Lower middle	46	43.0	94	32.1	
Upper lower and Lower	47	43.9	70	23.9	
Education					
Illiterate	22	20.6	29	9.9	<0.0001
Primary/Middle school	34	31.8	53	18.1	
High school/Secondary school	27	25.2	70	23.9	
Graduate and above	24	22.4	141	48.1	
History of COVID-19					
Yes	36	33.6	62	21.2	0.01
No	71	66.4	231	78.8	
Comorbid conditions*					
Diabetes Mellitus	10	9.3	35	11.9	0.466
Hypertension	16	15.0	50	17.1	0.614
Aware of COVID-19 vaccine					
Yes	65	60.7	252	86.0	<0.0001
No	42	39.3	41	14.0	
Source of Information*(n=65) (n=252)					
Family	42	64.6	86	34.1	<0.0001
Peers	14	21.5	83	32.9	
HCW	15	23.1	108	42.9	0.003
Leaders (Religious/Political)	3	4.6	15	6.0	0.677
Social media	1	1.5	18	7.1	0.089
News (TV/Radio/Print)	5	7.7	58	23.0	0.005

\*Multiple response, HCW: Health care worker

## Discussion

The present study aimed to explore the factors influencing COVID-19 vaccine acceptance and hesitancy among the rural population of Chengalpattu, Tamil Nadu, India. The findings of this cross-sectional study provide valuable insights into the dynamics of vaccine acceptance and hesitancy in a rural setting, contributing to the understanding of the challenges and opportunities in achieving widespread vaccine coverage.

Interestingly, the study uncovered the role of social networks and peer influence in shaping vaccine attitudes. Individuals who reported receiving information about the vaccine from trusted sources, such as family members, friends, or community leaders, were more likely to accept the vaccine.

This emphasizes the potential of community-based interventions and the utilization of local networks to promote vaccine awareness and uptake.

Our study revealed a significant variation in COVID-19 vaccine acceptance among the rural population of Chengalpattu. The overall acceptance rate of 73.2% reflects a positive inclination towards vaccination efforts. This is a promising sign for public health interventions and underscores the potential success of vaccination campaigns targeting rural communities. However, it is imperative to address the factors that contribute to vaccine hesitancy to ensure equitable vaccine coverage. In a study by Ain et al., merely 14% of the participants displayed absolute resistance to receiving the COVID-19 vaccine, while 40%

remained uncertain about their decision [15]. In a study by Kusuma et al., overall, 64.9% of participants indicated their willingness to take the vaccine, while 17.4% expressed uncertainty, and 17.7% declined to receive the vaccine [16]. In a study by Achrekar et al., 44.1% of participants expressed their reluctance to accept the booster injection [17]. In a study by Dkhar et al., out of the total respondents, 340 individuals (66.53%) indicated that they would either definitely or probably accept COVID-19 vaccination [18]. In a study Kaur et al., indicated that 63% of individuals displayed willingness to receive the vaccine, and 65% held a positive perception of immunization [19]. In a study by Islam et al., 79.5% of study participants expressed their intention to receive the vaccine, while 8.8% indicated they would not, and 11.7% remained undecided [20]. In a study by Chandani et al., 27% of participants were uncertain about receiving the vaccine, while 10% chose not to receive the vaccine [21]. In a study by Samanta et al., among the participants, 12.08% expressed disagreement with the importance of getting immunized against COVID-19. Approximately 9% of the respondents declined vaccination, while 30.8% exhibited vaccine hesitancy [22].

One of the key determinants of vaccine acceptance was perceived vaccine safety. Individuals who expressed concerns about potential side effects or lacked confidence in the safety of the vaccine were more likely to hesitate. This finding underscores the importance of transparent communication, accurate information dissemination, and addressing misconceptions about vaccine safety. Public health authorities should leverage community-based initiatives and local influencers to promote accurate information and alleviate concerns. In a study by Sharma et al., positive factors influencing the acceptance of COVID-19 vaccination include widespread public awareness of COVID-19, with 70% of individuals possessing a better understanding of the vaccines. Additionally, a positive attitude towards vaccination played a role. Participants were more likely to embrace vaccine acceptance if they perceived a higher risk of COVID-19, believed the vaccine would provide protection, and were confident it wouldn't lead to adverse effects [23].

In a study by Joshi et al., individuals with limited education, and lower financial resources were inclined to decline the vaccine [24]. In a study by Saxena et al., the highest percentage of individuals who have never received a vaccination is observed among those aged 18 to 45 years, accounting for 14.7% [25]. Additionally, 13.5% of men and 13.1% of women reported not having received a vaccination. In a study by Kusuma et al., vaccine hesitancy was associated with factors such as advanced age [16]. Study by Jetly et al., showed

that compared to the elderly, the younger generation exhibited higher rates of COVID-19 vaccination acceptability (70.4%) as well as vaccine hesitation (79.3%) [26].

In a study by Samanta et al., revealed a troubling degree of lack of knowledge and minimal factual comprehension regarding the COVID-19 outbreak and the associated vaccination campaign [22]. In a study by Kumar et al., vaccine hesitancy was attributed to concerns about vaccine effectiveness and safety, antivaccination beliefs, personal preferences, and a reluctance to be among the first to receive the vaccine [27]. In a study by Panda et al., the primary obstacles to the COVID-19 vaccine were identified as security concerns and a lack of understanding [28]. In the study by Joshi et al., the main drivers of COVID-19 immunization hesitancy (63%) stemmed from concerns and uncertainties regarding its effectiveness [24]. Chandani et al., approximately 20.63% of individuals appeared to lack information about the immunizations [21]. In a study by Kumar et al., vaccine hesitancy stemmed from specific anti-vaccination beliefs, apprehensions, lack of information, and doubts about the vaccine's efficacy [27].

Furthermore, our study identified various socio-demographic factors associated with vaccine acceptance and hesitancy. Education, income level, and access to healthcare services emerged as significant predictors. These findings highlight the need for targeted outreach efforts, especially among individuals with lower educational attainment and limited access to healthcare resources. Tailored communication strategies, community engagement, and mobile vaccination units could help bridge these gaps and enhance vaccine acceptance.

Despite the overall positive trend in vaccine acceptance, our study also identified specific reasons for vaccine hesitancy. Misinformation, distrust in the healthcare system, and belief in alternative treatments were cited as barriers to vaccination. Addressing these concerns necessitates a multi-pronged approach involving health education, engagement with local healthcare providers, and collaboration with community leaders to dispel myths and build trust. Achrekar et al., underscored the importance of implementing evidence-based initiatives to promote vaccine acceptance, particularly among hard-to-reach populations in emerging countries [17]. Parthasarathi et al., suggested to address vaccine refusal among specific populations, it is crucial to address underlying social and demographic factors and design targeted outreach campaigns [29].

Limitations of our study include its cross-sectional design, which restricts the establishment of causal relationships. Additionally, the study was conducted in a specific rural area and may not fully capture the

diversity of vaccine attitudes across different regions and contexts. Future research could employ longitudinal designs and expand the scope to include a broader geographical representation.

### Conclusion

In conclusion, our study underscores the need for targeted interventions to promote COVID-19 vaccine acceptance among rural populations. Strategies focusing on accurate information dissemination, community engagement, and addressing socio-demographic disparities are crucial in ensuring equitable vaccine coverage. By understanding the factors contributing to vaccine hesitancy, public health authorities can develop effective interventions that resonate with the unique needs and concerns of rural communities, ultimately contributing to the success of vaccination efforts and the control of the COVID-19 pandemic.

### References

1. Sharun K, Faslu Rahman CK, Haritha CV, Jose B, Tiwari R, Dhama K. COVID-19 vaccine acceptance: beliefs and barriers associated with vaccination among the general population in India. *J Exp Biol Agric Sci.* 2020;8(Spl-1-SARS-CoV-2):S210-8.
2. Bhartiya S, Kumar N, Singh T, Murugan S, Rajavel S, Wadhvani M. Knowledge, attitude and practice towards COVID-19 vaccination acceptance in West India. *Int J Community Med Public Health.* 2021;8(3):1170.
3. Wang PW, Ahorsu DK, Lin CY, et al. Motivation to Have COVID-19 Vaccination Explained Using an Extended Protection Motivation Theory among University Students in China: The Role of Information Sources. *Vaccines (Basel).* 2021;9(4):380.
4. Dodd RH, Pickles K, Nickel B, et al. Concerns and motivations about COVID-19 vaccination. *Lancet Infect Dis.* 2021;21(2):161-3.
5. Patel SK, Pathak M, Tiwari R, et al. A vaccine is not too far for COVID-19. *J Infect Dev Ctries.* 2020;14(5):450-3.
6. Thunstrom L, Ashworth M, Finnoff D, Newbold S. Hesitancy Towards a COVID-19 Vaccine and Prospects for Herd Immunity. *SSRN Electron J.* 2020:1-51.
7. Harapan H, Wagner AL, Yufika A, et al. Willingness-to-pay for a COVID-19 vaccine and its associated determinants in Indonesia. *Hum Vaccin Immunother.* 2020;16(12):3074-80.
8. Fu C, Wei Z, Pei S, Li S, Sun X, Liu P. Acceptance and preference for COVID-19 vaccination in healthcare workers (HCWs). *Med Rxiv* 2020.04.09.20060103
9. Lazarus JV, Ratzan SC, Palayew A, et al. A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med.* 2021;27(2):225-8.
10. Liu Q, Qin C, Liu M, Liu J. Effectiveness and safety of SARS-CoV-2 vaccine in real-world studies: a systematic review and meta-analysis. *Infect Dis Poverty.* 2021;10:132.
11. Doroshenko A. The combined effect of vaccination and nonpharmaceutical public health interventions ending the COVID-19 pandemic. *JAMA Netw Open.* 2021; 4:e2111675.
12. MacDonald NE. Vaccine hesitancy: Definition, scope and determinants. *Vaccine.* 2015;33:4161-4.
13. McIntyre PB, Aggarwal R, Jani I, et al. COVID-19 vaccine strategies must focus on severe disease and global equity. *Lancet.* 2022;399:406-10.
14. Rabaan AA, Al-Ahmed SH, Sah R, et al. SARS-CoV-2/COVID-19 and advances in developing potential therapeutics and vaccines to counter this emerging pandemic. *Ann Clin Microbiol Antimicrob.* 2020;19(1):40.
15. Ain S, Ahmad R, Qulsum R, Gilani MA. Potential vaccine hesitancy regarding COVID-19 vaccines in Kashmiri population. *J Educ Health Promot.* 2021;10:436.
16. Kusuma YS, Kant S. COVID-19 vaccine acceptance and its determinants: A cross-sectional study among the socioeconomically disadvantaged communities living in Delhi, India. *Vaccine X.* 2022;11:100171.
17. Achrekar GC, Batra K, Urankar Y, et al. Assessing COVID-19 Booster Hesitancy and Its Correlates: An Early Evidence from India. *Vaccines (Basel).* 2022;10:1048.
18. Dkhar SA, Jeelani A, Quansar R, Salim Khan SM. Acceptance of COVID-19 vaccine among healthcare workers before the launch of vaccine in India: An online survey. *J Educ Health Promot.* 2022;11:76.
19. Kaur A, Kaur G, Kashyap A, et al. Attitude and acceptance of Covid-19 vaccine amongst medical and dental fraternity—A questionnaire survey. *Rocz PanstwZakl Hig.* 2021;72:185–91.
20. Islam F, Agarwalla R, Panda M, et al. Assessment of the knowledge, preferences and concern regarding the prospective COVID-19 vaccine among adults residing in New Delhi, India —A cross-sectional study. *J Fam Med Prim Care.* 2021;10:2369–75.
21. Chandani S, Jani D, Sahu PK, et al. COVID-19 vaccination hesitancy in India: State of the nation and priorities for research. *Brain Behav Immun Health.* 2021;18:100375.
22. Samanta S, Banerjee J, Kar SS, et al. Awareness, knowledge and acceptance of COVID-19 vaccine among the people of West Bengal, India: A web-based survey. *Vacunas.* 2022;23:S46–55.

23. Sharma P, Basu S, Mishra S, et al. COVID-19 Vaccine Acceptance and Its Determinants in the General Population of Delhi, India: A State Level Cross-Sectional Survey. *Cureus*. 2022;14:e26936.
24. Joshi A, Surapaneni KM, Kaur M, Bhatt A, Nash D, El-Mohandes A. A cross-sectional study to examine factors influencing COVID-19 vaccine acceptance, hesitancy and refusal in urban and rural settings in Tamil Nadu, India. *PLoS ONE*. 2022;17:e0269299.
25. Saxena M, Patil NK, Sareen M, Meena M, Tyagi N, Tak M. A study to access the prevalence and drivers of COVID-19 vaccine hesitancy in Indian population including health care professional and dental students—A cross-sectional survey. *J Indian Acad Oral Med Radiol*. 2022;34:180–7.
26. Jetly S, Bhardwaj P, Arora G, et al. Hesitancy and Acceptance of COVID-19 Vaccination Amidst the Second Wave of Pandemic in India: A General Population Study. *Asia Pac J Public Health*. 2022;34:446–9.
27. Kumar R, Bairwa M, Beniwal K, Kant R. COVID-19 vaccine acceptability, determinants of potential vaccination, and hesitancy in public: A call for effective health communication. *J Educ Health Promot*. 2021;10:392.
28. Panda DS, Giri RK, Nagarajappa AK, Basha S. COVID-19 vaccine acceptance and concern of safety from the public perspective in the state of Odisha, India. *Hum Vaccin Immunother*. 2021;17:3333–7.
29. Parthasarathi A, Puvvada RK, Shankar M, et al. Willingness to Accept the COVID-19 Vaccine and Related Factors among Indian Adults: A Cross-Sectional Study. *Vaccines (Basel)*. 2022;10:1095.