

Attitude towards COVID-19 vaccination among the public in Kerala: A cross sectional study

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ABSTRACT

Context: As COVID-19 spread across the world, vaccines were developed to fight against the spread of the new disease. Negative attitude and unwillingness to vaccinate when available may be a major hurdle in attaining effective vaccination coverage. **Aims:** The aim of this study was to assess the attitudes towards the COVID-19 vaccine and identify the predictors of negative attitudes towards the vaccine and identify groups most at risk of uncertainty and unwillingness to receive a COVID-19 vaccine. **Settings and Design:** General public of Kerala, cross-sectional survey. **Methods and Material:** The study was conducted in Kerala during the period from 16 January 2021 to 22 February 2021. An online semi-structured questionnaire was sent via google forms with a consent form appended to it. Attitude towards vaccination was measured using a 20-item scale. **Statistical Analysis Used:** Collected data were analysed using SPSS software version 16. Ordinary least-squares (OLS) regressions were carried out to examine socio-demographic predictors of attitude towards vaccination. Multinomial logistic regression model was fitted to examine associations of socio-demographic with uncertainty and disagree to vaccinate against COVID-19. **Results:** In this study, 1345 subjects participated. Mean attitude score was 48.68 with SD 13.55. Most of the study subjects were agreeable to take the vaccine once it is available (88.8%). Religion, occupation, and monthly income were found to be the predictors of attitude towards vaccination. **Conclusions:** The willingness for vaccine uptake was found to be high in our study. However, other aspects such as doubt regarding its safety, effectiveness and duration of protection are considerable and need to be addressed.

Keywords: COVID-19, predictors, vaccine attitude, vaccine coverage, vaccine hesitancy, vaccination

Introduction

The new beta corona SARS Co-V2 has spread over countries around the world and inflicted almost unimaginable harm on the life, health and economy of many nations.

This pandemic had infected nearly 183 million people and caused 3 million deaths worldwide, whereas India had reported 29 million cases and 4 lakhs deaths.^[1,2]

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As the disease continues to ravage the world, scientists and organizations around the globe were working to develop safe and effective vaccines to control the infection, which is one of the most successful and cost-effective healthcare intervention for preventing infectious diseases.^[3,4] Achieving herd immunity through vaccination is important as it prevents a substantial proportion of the community from being infected.^[5]

The Government of India had started the vaccination drive for the healthcare workers on January 16 and as of July 7, 2021, nearly 293 million have been vaccinated with at least one dose.^[2] However, one of the major threats to the coverage of vaccines and successful mitigation of the pandemic is vaccine hesitancy.^[6]

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Vaccine hesitancy was defined by the WHO Strategic Advisory Group of Experts as “*delay in acceptance or refusal of vaccination despite availability of vaccination services*”.^[7] Uncertainty and unwillingness to receive COVID-19 vaccine will be a significant challenge in accomplishing the vaccination coverage required for population immunity.^[8] Vaccine hesitancy is associated with several factors and is present worldwide and has been labelled as one of the ten threats to global health in 2019.^[9-11]

The main reasons to decline the vaccines were the thought that it was produced in a hurry, may have side effects, doubt about the efficacy of the vaccines, and also many people believe that they have already developed immunity against the virus.^[12]

Furthermore, accessibility, physical availability and affordability also contribute to hesitancy. The potential vaccine uptake rate was found to be low during the initial phase even among health care workers like nurses and medical students due to uncertainty in vaccine efficacy, adverse effects, and effective duration of the vaccine.^[13,14] Vaccine hesitancy is also associated with refusal to participate in COVID-19 vaccine trials.^[15] Studies conducted in different countries have reported variables such as risk perception of the disease, safety, efficacy and general vaccination attitudes as the factors contributing to the acceptance of COVID-19 vaccine.^[5] Negative attitude to receive COVID-19 vaccine when available may be a major stumbling block in attaining effective vaccination coverage.

Therefore, it is important to estimate the predictors of negative attitude towards COVID-19 vaccines in Kerala. This will help in identifying the groups most at risk of uncertainty and unwilling to receive a COVID-19 vaccine. Primary care physicians have a key role in ensuring community participation in vaccinating the general public. Identifying the predictors of vaccine attitude, will help policymakers to recognise and adapt interventions that increase vaccine coverage. This mass vaccination programme is not without challenges, but the unrivalled experience in the delivery of the vaccination programmes such as childhood programmes and the successful delivery of millions of influenza immunisation yearly place primary care in a unique position to overcome the barriers and make the programme a great success. Moreover, primary care is well placed to curtail the discrepancy in vaccine uptake and thereby attenuate the inequalities arising during the vaccination programme.^[16]

Till now very few studies have been published to assess the attitude and explore the predictors of negative vaccine attitude in Kerala. Hence, this study aimed to assess the attitudes towards the COVID-19 vaccine and identify the predictors of negative attitudes towards the vaccine and identify groups most at risk of uncertainty and unwillingness to receive a COVID-19 vaccine.

Subjects and Methods

This cross-sectional study was conducted among adults in Kerala from January to February 2021. An online semi-structured

questionnaire was sent via google forms, with a consent form appended to it. The link of the questionnaire was sent through emails, WhatsApp, Telegram and other social media to the contacts of the investigators. The participants were motivated to roll out the survey to as many people as possible. The data collection was started after obtaining the Institutional Research Ethics Committee approval (SGMC-IEC-NO: 38/538/02/2021/F). Subjects 18 years and above and willing to participate in the study were included. The questionnaire was structured in English as well as in Malayalam, the regional language of Kerala. By clicking the link, the participants were directed to the information about the study and informed consent. The tool was developed after reviewing the literature and discussion with the research team and the tool was reviewed by experts in the field for face validity. The questionnaire consists of two parts, first part consists of socio-demographic variables such as age, gender, religion, educational status, employment status, marital status, place of residence as urban or rural, income status and the number of members in the family. Besides, study participants were asked whether they had tested for COVID-19 at any time, how many of the family members were affected with COVID-19 and how often do they follow the guidelines in the country to prevent the spread of the coronavirus. This was followed by 20 items to capture the attitude towards vaccination. Responses towards attitude were rated on a 5-point scale from “totally agree” to “totally disagree” with a maximum aggregate score of 100 and minimum aggregate score of 20. Higher score indicates negative attitude towards vaccination. The questionnaire required an estimate of 7-10 minutes to complete the google form. A pilot study was conducted to test the reliability of the tool, the reliability coefficient Cronbach’s alpha was obtained as 0.882. Sample size was calculated as 522 using prevalence of negative attitude (p) = 42.4%,^[17] relative precision (d) = 10%, and level of significance (alpha) = 5%

SPSS software (SPSS, Chicago, Illinois) version 16 was used to analyse the data collected. The frequency and percentage of qualitative variables were used to represent them. Quantitative variables were expressed in mean and standard deviation (SD) or median and interquartile range (IQR). Ordinary least-squares (OLS) regressions were carried out to examine socio-demographic predictors of attitude towards vaccination. Multinomial logistic regression model was fitted to examine associations of socio-demographic with uncertainty and disagree to vaccinate against COVID-19. The outcome variable was coded such that those who agree to vaccinate were compared to i) uncertainty about whether to vaccinate and ii) disagree to vaccinate. Results were presented as odds ratios (OR) with corresponding 95% confidence intervals (CI). A value of $P < 0.05$ was considered statistically significant.

Results

In this study, 1345 subjects from the different states of Kerala participated, among this 567 (42.8%) were from the urban area and the rest 767 (57.2%) from rural area. Median age is 25 years with

IQR = 17. Young adults constitute majority (59%) of the sample, whereas senior citizens above 65 years were the minority (3.6%). More than half of the subjects were Hindus, that is, 843 (62.7%), 188 (14.0%) were Christians, 158 (11.7%) were Muslims and the rest 156 (11.6%) were not ready to reveal their religion. Characteristics of the sample were described in Table 1. About 79% were confident in their overall health status, 20% respond that their health status is average and only 0.7% commented as bad health status. About half of the study sample (50.2%) were tested for COVID-19 and result was negative, 46% were never tested and 3.8% were tested as positive. About 97% reported that they were following the instructions of the Government to prevent the spread of the pandemic. The total attitude score ranges from 20 to 85 with mean score of 48.68 and SD 13.55. Out of this study sample only 51 (3.8%) reported to be tested positive for COVID-19 and 46% were not tested for the virus at any point in time. Most of the study subjects i.e 88.8% agreed to take the vaccine once it is available [Figure 1]. The majority (88.2%) were confident that they would get protection after being vaccinated, but 69.4% were worried about the side effects of the vaccine in future. More than half of the subjects (65.2%) were doubtful regarding the efficacy of the vaccine. About 11% believe that preventive measures such as wearing mask, maintaining social distance and using sanitizers helps in keeping the virus away, and hence vaccination is not needed. Few participants had apprehension of getting injected for vaccination (18.9%). Around 39.5% of participants were worried about vaccination allergies. Most subjects (66.2%) were doubtful about the duration of protection after being vaccinated. Cost and accessibility were also a huge concern for many, as close to 33.6% responded that they would be vaccinated only if available free of cost and 38% were ready to get vaccinated only if available to them nearby. Since the vaccine is produced in a short span of time, 32.7% were doubtful regarding the quality of the vaccine. About 44% believe, that they would still get infected by the corona virus, even after vaccination and 34.7% were of the opinion that natural immunity might last longer than vaccination.

To assess the predictors of attitude towards vaccination OLS analysis was done. Results are given in Table 2. Religion, occupation and monthly income were found to be the predictors of attitude and suggest that lower levels of monthly income and occupational group other than healthcare workers were associated with more negative views on vaccines. Multinomial logistic regression model was fitted to examine associations of socio-demographic with uncertainty and disagree to vaccinate against COVID-19. Results are shown in Table 3.

Demographically, groups at less risk for uncertainty to vaccinate against COVID-19 were healthcare professionals (OR = 0.440; 95% CI: 0.225-0.861) and those with degree/diploma as educational qualification (OR = 0.503; 95% CI: 0.288-0.880).

Discussion

Vaccination against COVID-19 along with preventive measures such as observing personal hygiene and behavioural

Table 1: Socio demographic pattern of study participants (n=1345)

Variables	Frequency (%)
Age	
18-29	795 (59.1)
30-49	365 (27.1)
50-64	136 (10.1)
>=65	49 (3.6)
Gender	
Male	613 (45.6)
Female	732 (54.4)
Education	
Up to High school	39 (2.9)
Plus 2	165 (12.3)
Graduate	799 (59.4)
Post Graduate/Post Graduate and above	342 (25.4)
Employment status	
Health care professional	285 (21.2)
Frontline worker	23 (1.7)
Others	1037 (77.1)
Income status	
<10000	207 (15.4)
10,000-30,000	353 (26.2)
30,000-50,000	239 (17.8)
50,000-75,000	181 (13.5)
>75,000	365 (27.1)

Table 2: Multiple linear regression predictors of attitude towards vaccination

Variables	Beta	t	P	95% CI
Age	-0.032	-0.851	0.395	-1.772-0.700
Gender	0.017	0.589	0.556	-1.064-1.978
Religion	0.111	4.090	<0.0001	0.723-2.057
Marital status	-0.010	-0.272	0.786	-2.312-1.750
Place of residence	-0.018	-0.649	0.517	-1.984-0.998
Occupation	0.114	4.073	<0.0001	0.545-1.557
Monthly income of family	-0.109	-3.812	<0.0001	-1.554-0.498
Educational status	-0.007	-0.241	0.810	-1.231-0.962
No of members in the family	0.023	0.856	0.392	-0.847-2.159

Religion, occupation and monthly income were found to be the predictors of attitude and suggest that lower levels of monthly income and occupational group other than frontline workers were associated with more negative views on vaccines

change is the most effective measure for preventing its spread. However, mere availability of even the best vaccine without its use would not be effective in any way. Negative attitude towards vaccination is a barrier towards the fight against the COVID-19 pandemic. The present study found an overwhelming response towards COVID-19 vaccination uptake as majority of the participants, that is, 89% agreed to get vaccinated of which 72% were fully willing to get vaccinated against COVID-19. However, these findings may not capture the attitude of those who are not familiar with the online data collection approach. Similar findings have been reported from studies done in India and in Malaysia.^[4,5,18] Other two similar studies conducted in India reported about 70% were willing to get vaccinated, where the inclination is less than that reported in the present study.^[3,19] A cross-sectional

Table 3: Predictors of undecided and disagree to vaccinate against COVID-19 using multinomial logistic regression

Variables	Neither agree nor disagree		Disagree	
	OR	95% CI	OR	95% CI
Age				
18-29	0.699	0.222-2.200	2.026	0.382-10.735
30-49	0.756	0.285-2.006	1.261	0.268-5.925
50-64	0.695	0.227-2.132	2.189	0.439-10.917
>64 (Ref)				
Gender				
Male (Ref: Female)	1.251	0.791-1.978	1.343	0.755-2.386
Occupation				
Health care professional Others (Ref)	0.440	0.225-0.861	1.124	0.556-2.273
Monthly Income				
<10000	1.410	0.698-2.847	1.693	0.704-4.071
10000-30000	1.181	0.643-2.170	1.293	0.591-2.827
30000-50000	0.635	0.302-1.336	0.640	0.238-1.718
50000-75000	1.085	0.534-2.204	1.561	0.670-3.637
>75000 (Ref)				
Education				
School level	0.593	0.290-1.212	1.045	0.437-2.499
Degree/Diploma	0.503	0.288-0.880	0.604	0.295-1.234
PG/PG & above (Ref)				
Marital status				
Married (Ref:Unmarried)	0.914	0.437-1.911	1.483	0.632-3.483
Place of residence				
Rural (Ref:Urban)	1.269	0.810-1.988	0.963	0.547-1.697

*Ref: Reference category. Agree to vaccinate was the reference group in multinomial logistic regression model. Groups at reduced risk for uncertainty to vaccinate against COVID-19 were healthcare professionals (OR=0.440; 95% CI: 0.225-0.861) and those with Degree/diploma as educational qualification (OR=0.503; 95% CI: 0.288-0.880)

study conducted in Kerala among 213 participants reported 80.2% were ready to take vaccine.^[20]

A nationwide survey conducted in America in 2020 had reported that nearly half of the participants, that is, 42.4% had hesitancy towards vaccination. Considering that the study was carried out during the peak of the COVID-19 pandemic in mid-April 2020 when deaths were also high, this was a significant finding.^[17] A study by Paul in 2020 in UK found that only 63.5% of participants readily agreed that they would get vaccinated when a vaccine is available.^[8] Studies conducted in Saudi Arabia reported willingness to get vaccinated as 44.7% and 64.7% respectively.^[21,22] The lowest rate of acceptance was reported by Jordan as 37.4%.^[23] A study conducted among health care workers in Congo during March–April 2020 reported only 27.7% were willing to get vaccinated,^[24] this low level of willingness may be attributed to the early period of the pandemic and the African continent was the least affected at that time.

The acceptance of vaccines depends on several parameters; however, many are concerned about the safety and efficacy. In this study 69.4% were worried about the side effects, 65.2% were doubtful about the efficacy of vaccine. Whereas another study done in Kerala reported this concern as 41.3%.^[20] This study almost agree with the studies in India (64.6%, 75.5%)^[4,18] and is in line with the study conducted in the US (63%) while another study conducted in Jordan reported about 50% were concerned about this.^[23,25] A study by Pogue in the US found that

people’s readiness to vaccinate was found to increase with the increasing efficacy of the vaccine.^[25] Another study conducted in the US reported that reduced incidence of side effects were associated with an increase in willingness to accept the vaccine.^[26] A discrete-choice Experiment conducted among the Dutch population found that effectiveness (41%), safety (29%), advice regarding the vaccination (19%), and media coverage (4%) were some important attributes influencing vaccine uptake during pandemics.^[27]

The study done in Malaysia reported very high concern over side effects (95.8%).^[15] A similar study conducted in India reported 55% believed that vaccination would be safe and 53.8% worried about the efficacy.^[18] A study conducted in Saudi Arabia reported uncertainty regarding safety, effectiveness and side effects as 55.4%, 56.1% and 79.9% respectively.^[21] In this study about 44% believe, that they would still get infected by the coronavirus, even after vaccination. However, a systematic review concluded the findings of clinical trials related to the COVID-19 vaccine, reported that most of the vaccines are safe and effective.^[28] Both print and online media should take necessary steps to unfurl the information regarding the safety and efficacy of COVID-19 vaccine to ensure its acceptance and coverage.

Individuals were concerned about the cost of the vaccine, in the present study 33.6% reported that they would accept the vaccine only if available free of cost whereas, another study in

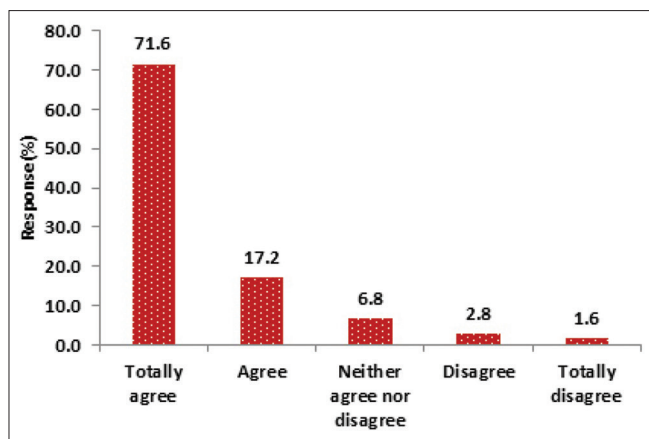


Figure 1: The level of agreement to get vaccinated when the vaccine becomes available

Kerala reported that 46.9% are willing to pay for vaccination.^[20] A study conducted in India reported 69.6% to have concerns regarding the cost, unlike the study among Dutch population reported this as 7%.^[4,27]

This study extracted the predictors of attitude as religion, occupation and monthly income. Another study conducted in India revealed that age, marital status, place of residence, educational level, occupation, monthly family income, profession, presence of a chronic disease, and perceived health status as the predictors.^[4] The present study is in consistent with the study conducted in Malaysia, but in contrast with the studies conducted in China and Saudi Arabia which showed gender and marital status as the significant predictors.^[5,22,29] A study conducted in Indonesia reported none of the socio-demographic variables were associated with vaccine hesitancy.^[30] Age, gender and employment status were found to be significant predictors in the study conducted in Jordan.^[23] A study conducted in Poland revealed that women are more concerned about vaccination coverage.^[6] The difference observed in these studies might be due to the varying socio-demographic characteristics among the study populace.

Efforts must therefore be directed towards the increasing willingness of the community by increasing their knowledge regarding the vaccine benefits, side effects which will help alleviate fears regarding vaccination against COVID-19. The results of this study implied that education and occupation had a positive influence on the decision to vaccinate. Health care workers were less hesitant to vaccinate when compared with others (OR = 0.440; 95% CI: 0.225-0.861). This concurs with the study conducted in Indonesia where health care workers are twice as likely to receive vaccine, whereas the study in Malaysian population reported students were more accepting in contrast to health care professionals.^[5,30]

A study conducted in Indonesia found that health care workers were more supportive of the vaccine. Factors that could possibly increase health care workers willingness to get

vaccinated were perceived risk and comprehensive knowledge regarding COVID-19. Also, self-protection and desire to protect family members have been mentioned as reasons to get vaccinated.^[30] Similarly, in our study, graduates were less hesitant to vaccinate (OR = 0.503; 95% CI: 0.288-0.880) compared to postgraduates and higher qualified. Poor income was found to be associated with negative views on vaccination. This is in consistent with the studies by Paul *et al.* and Alwi *et al.*^[5,8] WHO has recommended that an enabling environment in addition to open communication from trusted sources, social influences and motivation for increasing uptake of COVID-19 vaccines.^[31] The Government of India seeks to achieve this through the social influence from experts to spell out the process of immunisation, its safety and decision to conduct the drive in a phased manner, establishment of a National Media Rapid Response Cell (NMRRRC), involvement of frontline workers and community mobilizes to engage with the community through religious leaders, panchayath, civil service organisations and self-help groups.^[32]

Though this study was carried out during the initial phase of the vaccination drive, majority (88%) were agreed to be vaccinated, still there was apprehension regarding safety and efficacy of the vaccine. There was lesser hesitancy for vaccination among health care workers and those with higher educational degrees compared to general public. Reasons for vaccine hesitancy were concerns regarding safety, efficacy and cost of vaccines.

Limitations

Although the study's generalizability is restricted because it had been conducted via a social media app, policymakers should consider these findings when planning vaccination efforts among the general public. However, more research is required to generalise the findings to the Kerala population, particularly in tribal areas, rural areas and among individuals who are unfamiliar with social media gadgets.

Conclusion

Though willingness for COVID 19 vaccination was found to be high in our study, around two third public were worried about the side effects of the vaccine and doubtful regarding its effectiveness. A large vaccination drive in a shorter period is the need of the hour, the key people involved at the peripheral level are the primary care doctors and the field staff. The attitude of public and trust plays an important role in achieving success in this venture. Hence those aspects influencing vaccine uptake such as doubt regarding its effectiveness and hesitancy among the general population is considerable and need to be addressed.

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Conflicts of interest

There are no conflicts of interest.

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