Research Article

COVID-19 Vaccine Acceptance and its Determinants among Adult Population of Chengalpattu District: A Mixed-method Study

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A B S T R A C T

Background: India has introduced a new COVID-19 vaccine recently which is made primarily available for healthcare workers and frontline workers. Globally, few other vaccines were also been approved against the SARS-CoV-2, whereas only little is known about its acceptance in the community. However, vaccine hesitancy is a public health threat. Therefore, this study was aimed to assess the acceptance of the COVID-19 vaccine and its determinants.

Method: A mixed-method design starting with a cross-sectional study using a pre-tested, semi-structured questionnaire between December 2020 – January 2021 among adults (18 years and above) residing in Chengalpattu followed by a qualitative approach with five key informant interviews was planned. Based on previous studies, the sample size was approximated to 140 which was collected through a simple random sampling method. Collected data were analysed using IBM-SPSS, v21.0. Statistical significance was described using the chi-square test, $p < 0.05$ was considered significant.

Results: Among the 140 respondents, the majority 56 (40%) had acceptance of the COVID-19 vaccine while 34 (24.3%) were inconclusive of their decision on vaccine acceptance. The most preferred characteristics of the COVID-19 vaccine felt by those showing willingness to vaccinate were both minimal side effects and cost-effectiveness 24 (42.9%). The majority 33 (58.9%) of the respondent's decision-making depends on the doctor's recommendation regarding vaccination. Statistical significance ($p < 0.008$) was perceived among gender and vaccine acceptance.

Conclusion: A large proportion decided to delay vaccination due to increased concern about vaccine side effects reported in various other countries. This concern should be dealt with to develop an effective mass vaccination strategy against the COVID-19 and increase vaccine coverage.

Keywords: COVID-19, Coronavirus, SARS-CoV-2, Mass Vaccination, Efficacy

Introduction

The world faces multiple health challenges every day, one among them is the recent COVID-19 pandemic. COVID-19 is an infectious disease caused by SARS-Co-V2 that was first identified in Wuhan city, Hubei province of China, in December 2019. On January 30, 2020, the World Health Organization (WHO) has declared COVID-19 a public health emergency of international concern. Later, on the 11th of March 2020, the WHO announced COVID-19 as a pandemic.[1] India holds second position with 10,305,788 confirmed cases of COVID-19 to date.[2] On 30 January 2020, India reported the first case of COVID-19. Tamil Nadu has reported nearly 8 lakh confirmed cases of COVID-19 with 12,146 deaths to date. The highest prevalence of cases is recorded in Chennai followed by Coimbatore and Chengalpattu.[3]

Vaccines save millions of lives each year.[4] Vaccination at present prevents 23 million deaths per year and an additional 1.5 million deaths could be prevented if global immunisation coverage were enhanced.[5] The development and distribution of a vaccine is hence a promising strategy to overcome this pandemic crisis. Immunisation agenda 2030 represents the lessons learnt from the past decades and helps in identifying the continuing and emerging challenges posed by various infectious diseases (e.g., Ebola, COVID-19).[6] The WHO is prudently hopeful that harmless and effective COVID-19 vaccines will be successfully developed. Herd immunity against SARS-CoV-2 would necessitate vaccination of approximately 67% of the total population.[7] Currently, three COVID-19 vaccines have been authorised for use by several national regulatory authorities.[8]

Through Fair Allocation agenda of a worldwide association, Access to COVID-19 Tools Accelerator (ACT), the development, manufacture and fair access of COVID-19 tests, treatments, and vaccines are accelerated.[9] This framework recommends that once secure and efficient COVID-19 vaccines are approved for use, all countries would have doses in proportion to their population size to vaccinate the high-priority groups. In the subsequent phase, vaccines would be arranged for all nations to facilitate additional population coverage according to national priorities.

India conducted an initial dry run in all states to test linkage between planning, implementation and to identify challenges before actual implementation on January 02, 2020.[10] Following which vaccines against COVID-19 were launched across all states for healthcare providers and frontline workers on January 16, 2020.[11] There is a day-to-day increase in updates regarding the COVID-19 vaccine yet very little is known about vaccine acceptance in the community among the general population. Therefore, this study was aimed to assess the acceptance of the COVID-19 vaccine and its determinants among the rural areas of Chengalpattu.

Materials and Method

A community-based cross-sectional study with a mixed-method design was conducted from December 2020 to January 2021 to access the COVID-19 vaccine acceptance status among the rural population of Chengalpattu using a semi-structured pretested questionnaire. The Institutional Ethics Committee approval was obtained before starting the study. Based on the previous studies, the prevalence of COVID-19 vaccine acceptance was 91.3% assuming a 95% confidence interval and allowable error of 5%, the sample size is calculated to 127. Allowing a 10% non-responsive rate, the sample size was calculated to be 140.

The quantitative data were collected from the residents in the selected rural areas by interviewing the adult members in the sampled household. Qualitative data were collected from five-key informants (School headmaster - K1; Male social worker - K2; Village head female - K3; Ward councillor - K4; Village head male - K5) in the selected area. Data collection was done between the 10th - 25th of December 2020. We conducted a face-to-face interview with a semi-structured interview guide in the location negotiated with participants. Interviews were audio-recorded for further analysis.

A brief description of the study, its objectives, and the declaration of anonymity and confidentiality were explained to the participants before collecting the data. Informed and written consent was taken from all the participants at the time of enrolment. Participants were also requested to be honest in their responses. Following this, the participants were asked to answer questions related to COVID-19 vaccine acceptance and their determinants. During the survey, participants were given full freedom to stop study participation at any stage before completing the questionnaire.

The rural field practising area is situated 25 km away from the tertiary care hospital. It covers 12 villages under two blocks with a total population of 39,545 (census 2011). Through the multistage probability sampling method, three villages are selected, followed by households are selected by simple random sampling technique. The required number of samples are collected based on certain inclusion criteria like age (18 years and above), permanent residents (residing > 3 years), and exclusion criteria such as pregnant mothers, those who already enrolled themselves for vaccine trials, mentally ill, and those who couldn't be met even after two consecutive visits were excluded. Qualitative data were collected from key informants who are closely linked to the study population and have knowledge about the issues or problems in that community. Five such participants selected are the School Principal, Village Heads, Councillor, and social workers from the respective rural areas of study.

A semi-structured pretested questionnaire was designed to assess the quantitative data on COVID-19 vaccine acceptance and their determinants. It contains 2 segments. The first part comprises a socio-demographic profile. The second part comprises questions related to COVID-19 vaccine acceptance and factors determining them. A semi-structured interview guide was prepared to collect qualitative data. The interview guide had a few initial engaging questions on vaccination and COVID-19 followed by a few probing questions on acceptance of the new COVID-19 vaccine.

Statistical Analyses

All statistical analyses were performed by using IBM-SPSS v21.0. Quantitative variables were described in the terms of percentage. The association between the categorical variables was assessed using the Chi-square test. For all analyses, $p < 0.05$ was considered statistically significant. Qualitative raw data were first transcribed to Microsoft Word 2016. The data were organised, analysed around the study objective, and coded manually. Major themes were identified and findings were interpreted accordingly.

Results

Quantitative Data

Out of 140 respondents, the majority 57 (40.7%) belonged to the age group of 18-30 years followed by the age group of 31-45 years who were around 39 (27.9%) and so on. Considering other socio-demographic features females were 85 (60.7%), skilled/ semi-skilled workers were 55 (39.3%), married were higher 71 (50.7%) when compared to unmarried 53 (37.9%), majority of the respondents 65 (46.4%) belonged to class II of modified BG Prasad's socio-economic classification and furthermost the respondent's educational status was up to schooling 64 (45.7%) in this study (Table 1).

Table 1. Sociodemographic Characteristics of Participants (n = 140)

Sociodemographic Characteristics	n	%
Age (years)		
18-30	57	40.7
31-45	39	27.9
46-60	25	17.9
≥ 60	19	13.6
Gender		
Male	55	39.3
Female	85	60.7
Occupation		
Professional/ Semi-Professional	29	20.7
Skilled/ Semi-skilled	55	39.3
Unskilled	28	20.0
Unemployed	28	20.0
Marital status		
Married	71	50.7
Unmarried	53	37.9
Widow/ Separated/ Divorced	16	11.4
Educational status		
School	64	45.7
Diploma	15	10.7
Undergraduate degree	47	33.6
Postgraduate degree	14	10.0
Socio-economic class		
Class 1	20	14.3
Class 2	65	46.4
Class 3	41	29.3
Class 4	14	10.0
Class 5	0	0

Table 2. Overall COVID-19 Pandemic Assessment (n = 140)

Variables	n	%
Family members affected by COVID-19		
Yes	16	11.4
No	124	88.6
COVID-19 had major impact on daily life		
Agree	57	40.7
Neutral	60	42.9
Disagree	23	16.4
Concerned about acquiring COVID-19		
No	65	46.4
Yes	75	53.6
COVID-19 preventive measures		
Social distancing, wearing mask, hand sanitisation	96	68.6
Vaccination	5	3.6
Both of the above	33	23.6
Others	6	4.3
Willing to accept COVID-19 vaccine		
No	50	35.7
Yes	56	40
Not sure	34	24.3

On assessing the overall COVID-19 pandemic, 16 (11.4%) of 140 respondents' family members were affected by COVID-19 infection. 57 (40.7%) mentioned that COVID-19 had a major impact on their daily life. Out of the 140 respondents, 75 (53.6%) were concerned regarding acquiring COVID-19 infection in the future. Majority of the respondents 96 (68.6%) considered social distancing, wearing masks, and hand sanitisation as preventative measures to protect themselves from infection. 56 (40%) had acceptance of COVID-19 vaccine was while 34 (24.3%) were inconclusive of their decision on vaccine acceptance (Table 2).

Minimal side effects and cost-effectiveness 24 (42.9%) were the major required characteristics of the COVID-19 vaccine felt by those who showed a willingness to vaccinate. When asked for preference based on side effects, 32 (57.1%) preferred a vaccine that has no side effects. 30 (53.6%) wished to delay their vaccination until they confirm vaccine safety on others. The majority 33 (58.9%) of the respondent's decision-making depends on the doctor's recommendation regarding vaccination. Regarding the cost factor 24 (42.9%) preferred vaccine cost less than Rs. 500. 26 (46.4%) showed vaccine acceptance for either domestic or imported vaccines followed by 23 (41.1%) who preferred only domestic COVID-19 vaccines (Table 3).

Table 3. Frequency Distribution of Variables associated with Acceptance of COVID-19 Vaccine (n = 56)

Variables	n	%
Required characteristics of vaccine		
High effectiveness	22	39.3
Minimal side effects, cost-effectiveness	24	42.9
All of the above	10	17.9
Expected side effects		
No side effects	32	57.1
Fever	14	25
Others	10	17.9
Source of information regarding COVID-19 vaccine		
Social media/ TV/ Radio	35	62.5
Newspaper	3	5.4
Friends/ family	3	5.4
All of the above	15	26.8
Preferred timing for vaccination		
As soon as possible	26	46.4
Delay vaccination until I confirm vaccine safety	30	53.6
Decision making on vaccination		
Based on doctor's recommendation	33	58.9
Based on vaccination method and frequency	17	30.4
All of the above	6	10.7
Expected cost of COVID-19 vaccine		
Free	21	37.5
Less than INR 500/-	24	42.9
Between INR 501/- to INR 2000/-	11	19.6
Type of vaccine preference		
Domestic vaccine	23	41.1
Imported vaccine	7	12.5
Any of the above	26	46.4

Table 4. Bivariate Association between Socio-demographic Factors and Acceptance of COVID-19 Vaccination among Respondents in Rural Areas of Chengalpattu (n = 106)

Variables	Willingness to vaccinate		
	No (n = 50)	Yes (n = 56)	P value
Age (years)			
18-30	21	20	
31-45	13	19	0.665
46-60	9	12	
≥ 60	7	5	
Gender			
Male	27	16	0.008
Female	23	40	
Occupation			
Professional/ Semi-professional	7	14	
Skilled/ Semi-skilled	19	22	0.441
Unskilled	12	11	
Unemployed	12	9	
Marital status			
Married	22	35	
Unmarried	22	15	0.138
Widow/ Separated/ Divorced	6	6	
Educational status			
School	24	26	
Diploma	6	5	0.454
Undergraduate degree	14	22	
Postgraduate degree	6	3	
Socio-economic class			
Class 1	8	7	

Class 2	19	26	0.845
Class 3	18	18	
Class 4	5	5	
Family members affected by COVID-19			
Yes	4	6	0.633
No	46	50	
COVID-19 had major impact on daily life			
Agree	22	21	0.581
Neutral	20	28	
Disagree	8	7	
Concerned about acquiring COVID-19			
No	34	21	0.002
Yes	16	35	

Bivariate association between socio-demographic factors and acceptance of COVID-19 vaccination among the respondents exhibited statistical significance for gender ($p < 0.024$) and concern about acquiring COVID-19 infection ($p < 0.001$) (Table 4).

Qualitative Data

The analysis of the qualitative data collected from five key informants led to the emergence of three main themes: 1) COVID-19 vaccine acceptance, 2) it's perceived barriers, and 3) opinion on improvement.

COVID-19 Vaccine Acceptance

COVID-19 vaccine acceptance mainly depends on the characteristics like fear of acquiring COVID-19, health news published in television and newspaper regarding vaccine status, vaccination cost, also the assurance given by doctors and health officials to the people for vaccination.

K1 mentioned that '…. adding to it if the vaccines are made purchasable by people's own money, people are willing to vaccinate…. because people are thinking free vaccines are not effective that's why it is distributed for free….'.

K4 detailed that '…. If vaccine comes to my village…. Villagers will get vaccinated…. Also, people in the village are aware of mild side-effects like fever, cold, headache telecasted in television news channels…. So, they may hesitate in the beginning to vaccinate…'.

K5 mentioned that '…. recently in TV news I heard that some new form of coronavirus is spreading… and it causes severe disease pattern and difficult to treat…. So, if scientists and government give assurance that this new type of disease spread can be prevented by taking the vaccine…. People will trust and vaccinate themselves….'.

Perceived Barriers

The perceived barriers to avoiding being vaccinated for COVID-19 are fear of side effects, delay in vaccination by governmental officials, lack of awareness created by concerned officials to the public, overemphasising by media regarding the COVID-19 vaccine and personal reasons.

K3 and K2 stated that '…. people will not believe if someone suddenly says the vaccine is good and effective… they will avoid vaccination because of lack of trust in the new vaccine…. if only, they see people taking vaccines and live without side-effects…. they'll come forward and get vaccinated…'.

K5 mentioned that '…. it is mainly because of the knowledge regarding vaccine side-effects that they hear on television… so they might be scared… if some rumours start spreading about the side effects then they won't come for vaccination… if assurance is given both from the government side and doctors side regarding the vaccination, they might vaccinate in future….'.

Opinion on Improvement

Through the analysis the opinion made by the participants to improve the vaccination status are increased awareness creation regarding the COVID-19 vaccine, active involvement of Anganwadi workers, scheduling the vaccination date and announcing through audio aids or pamphlets, organising meetings for village heads, doctors, nurses in the concerned village to discuss and clarify the plan of action.

K1 remarked that '…my opinion on implementation is a proper announcement regarding the COVID-19 vaccine through audio aids…. Followed by the door-to-door announcement and doubts clarification by Anganwadi workers and VHN's… also, by this approach crowding can be avoided in public places….'.

K2 commented that '…. Since the vaccine is new, instead of nurses injecting the vaccine I think doctors can inject the drug… so people will also have the satisfaction that doctor will not harm as he is knowledgeable person…and less fear regarding the vaccine administration…'.

K4 briefed that '…. we can speak about the vaccine in the Grama Sabha meeting or conduct awareness program in PHC at fixed dates and ask health professionals like the chief doctor to speak on the benefits of vaccination… and it can be issued to everyone on ward basis with so that everyone will be covered, no one will be leftover….'.

Discussion

The present study findings showed that vaccine acceptance for COVID-19 is 56 (40%) when compared to those who said "no" and "not sure" 50 (35.7%) and 34 (24.3%) respectively in the rural areas of Chengalpattu. Those respondents who had no acceptance for vaccine stated reasons like "fear of side effects" "not effective" "am healthy" "I don't need them" which was also cited by the interviewed key

informants as barriers for vaccination. A similar study by Fu C et al.[12] had 76.4% vaccination acceptance among the Health care workers when compared to 72.5% willingness among the general population. Also, a study by Wang J et al.[13] showed that most of the respondents 91.3% would accept COVID-19 vaccination among the Chinese population. Comparatively the level of significance for vaccine acceptance between the present and previous studies was found to be less.

Whereas a study by Lazarus JV et al.[14] showed a low level of vaccine acceptance of nearly 27.3% in Poland and 54.9% in Russia. Also, the recent DCVTS-4 survey on the COVID-19 vaccine in Delhi has shown relatively increased vaccine hesitancy among the respondents.[15]

There is a positive association between female sex and acceptance of COVID-19 vaccination in our study which refutes the findings of a study by Dror AA et al.[16] where a positive association between male sex and COVID-19 vaccine acceptance was derived. Also, a study by Detoc M et al.[17] revealed that (72.4%) majority of those who accepted to vaccinate were females.

Our study also emphasised that concern about acquiring COVID-19 infection is a potential predictor towards intention behind vaccination which was also seen in a study by Al-Mohaithef M et al.[18] where the participants with a higher perceived risk of infection were more likely to be vaccinated than those with a lower risk. Various other studies have acknowledged that perceived risk of attaining disease has a major role in vaccination acceptance.[19]

Minimal side effects and cost-effectiveness were cited as expected characteristics of the new vaccine by majority 24 (42.9%) of the respondents in the present study, however, the percentage of high vaccine efficacy dropped to 39.3% but studies by Harapan H et al.[20] showed that 93.3% of the participants would get vaccinated if a vaccine with 95% efficacy is being provided free of cost by the government.

The current study reflected intention to vaccinate based on their doctor's recommendation as high as 58.9% which was found to be equivalent in a study by Wang J et al.,[13] were the findings highlighted doctor's recommendation (80.6%) to be higher in decision-making regarding vaccination followed by vaccine convenience (75.7%).

The present study findings concluded that 46.4% will accept vaccine as soon as made available while 53.6% liked to postpone the vaccination until safety is confirmed among others. Similarly, a study by Gadoth A et al.[21] also specified that 66.5% of the participants would postpone their vaccination and only 32.3% were willing to take up the new COVID-19 vaccine immediately after commencement. In another study, 70.44% of the participants reported that they were willing to get vaccinated and 29.55% of

participants were not willing to get vaccinated.[22] These differences could be due to differences in the study setting and population.

Paid vaccination was preferred by 35 (62.5%) respondents over free vaccination issued by the government which was chosen by 21 (37.5%) respondents. The same preference was mentioned by one of the key informants (K1) in his interview. A study by Harapan H et al.[23] also had a significant level of respondents (73.8%) willing to pay for the COVID-19 vaccine.

The majority (46.4%) are satisfied with either domestic or imported vaccines while 41.1% preferred domestic vaccines over imported vaccines in the present study. Parallelly, a study by Wang J et al.[13] showed 64.2% having no preference for domestic or imported vaccines, while 32.5% would prefer a domestic vaccine.

The study was conducted for the imaginary vaccine which is to be made available for use in the future. Hence, the elusive nature of the vaccine is a limitation of the study. The results might vary from real practice hence it requires similar studies to be conducted after the vaccine is made available to the public.

Conclusion

This vaccine acceptance study among the rural population of Chengalpattu reflected a significantly low acceptance rate. Addressing sociodemographic determinants and concern about side effects relating to the COVID-19 vaccination may help to increase acceptance of the vaccine, thereby increasing the herd immunity in the population which can help in effectively tackling the current pandemic. Health education and communication from authoritative sources to improve the community's concerns about vaccine safety requires special attention during the vaccination drive. Moreover, improved trust in vaccine development and approval may reduce vaccine hesitancy.

Conflict of Interest: None

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