

# VACCINE HESITANCY TOWARDS COVID-19 VACCINE IN TAMIL NADU – A CROSS SECTIONAL STUDY

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## Abstract

**CONTEXT :** Government of Tamil Nadu introduced the COVID-19 vaccination in a phased manner. Until 16th July 2021, 4.7 million and 19.8 million people have been fully and partially vaccinated. Despite vaccine availability and vaccination centre strategically spread across the state, the vaccination coverage continues to be low.

**AIM :** This study is planned to assess the prevalence of vaccine hesitancy and to understand the factors leading to vaccine hesitancy among the public of Tamil Nadu.

**SETTINGS AND DESIGN :** A cross-sectional study was conducted in all the health unit districts of Tamil Nadu. With a cluster size of 30 in each, total sample size covered was 2855 in 95 clusters. In each cluster, adults aged  $\geq 18$  years were surveyed using interviewer-administered questionnaire which had a section on demography, vaccination information, and perception towards vaccination. Data analysis was done using SPSS version 16. Chi square was used for inferential statistics with p value  $< 0.05$  considered as statistically significant.

**RESULTS :** Overall prevalence of vaccine hesitancy and refusal i.e. not willing to get vaccinated in the future was 51.2% and 12% respectively. Among non-vaccinated, unawareness of where to get vaccine was the most common reason quoted. Among vaccine refusers, complacency that they will not get Covid infection is the most common reason quoted. There was a significant gender, urban rural locality and age wise difference on the factors determining vaccine hesitancy.

**CONCLUSION :** A targeted approach should be followed to fight hesitation and further increase acceptance among people.

**KEY WORDS :** Vaccine hesitancy, vaccine refusal.

**KEY MESSAGES :** Among non-vaccinated, unawareness of where to get vaccinated was the most common reason for not getting vaccinated. Proximity to vaccination centres is a key determinant for improving the vaccination coverage among women. Larger proportion of adult population aged  $> 60$  years reported 'fear of death' as the reason for vaccine hesitancy.

## INTRODUCTION

Government of Tamil Nadu introduced COVID-19 vaccination in a phased manner, offering 'Covaxin' and 'Covishield' free of cost to all adults aged  $\geq 18$  years in 632 fixed vaccination centres across the state.<sup>1</sup> Until 16th July 2021, 4.7 million people and 19.8 million had been fully and partially vaccinated respectively.<sup>2</sup> Despite vaccine availability and vaccination centres strategically spread across the state, there is a delay in the acceptance or refusal of vaccines which is defined as vaccine hesitancy.<sup>3</sup> This study was conducted to assess the prevalence of vaccine hesitancy and the factors leading to vaccine hesitancy among the people of Tamil Nadu.

## SUBJECTS AND METHODS

A cross-sectional study was done in all health unit districts of Tamil Nadu. The number of the sample size required to be included in the sample with 95% confidence with an assumed prevalence of 50%, and 5% margin of error was calculated using the following formula  $= \frac{Z\alpha^2 pq}{d^2}$ . Corrected sample size = (estimated sample size x Design effect x age group estimate) / anticipated response rate. With design effect of two, age group to be estimated three (18-44 years, 45-60 years,  $> 60$  years) and anticipated response rate of 80%,

minimum sample size required was 2880. With a cluster size of 30 in each, to cover 2880 sample size the total number of clusters required is 96. The Public Health Department of Tamil Nadu has stratified the state into 45 Health Unit Districts (HUD) for the better implementation and management of health-related programs. Within each HUD, the number of clusters was chosen based on population proportion to size. Habitation in rural areas and streets in urban areas were taken as clusters. The list of the habitation and streets in each HUD was obtained from the Epidemic Section of the Directorate of Public Health and Preventive Medicine. Clusters in each HUD were selected by a simple random sampling method. Each habitation and street in the rural areas and urban areas respectively were assigned a unique number for each HUD. In the second stage, in each of the selected clusters, one GPS coordinate was randomly selected, which was considered as the central point. From this central point, the survey team moved to their left to reach at least 30 households. In the selected household, one adult member of all the available household members was randomly selected



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by the KISH method. The survey was conducted during July 2021. All adult persons living in the household aged  $\geq 18$  years of age who gave informed written consent were included. The sample size covered was 2855. Two survey team comprising 2 field health workers (one male and one female) was formed in each HUD. Each survey team covered one cluster /day/team. The survey teams were supervised by a Medical Officer. To ensure quality and standardisation of data collection, all the survey team members were trained by the investigators on the sampling method and the questionnaire. Participants were surveyed using the interviewer-administered questionnaire. The questionnaire had a section on demography, vaccination information, and perception towards vaccination. For this study, factors for vaccine hesitancy were grouped as convenience, confidence, complacency, service provider-related challenges, awareness issues, and history of prior Covid 19 infection. An android based handheld mobile phone was used to collect survey data making the process easy, quick, flexible. 'Commcare' app which was pre-tested on handheld devices was used to collect the data with quality check on data collected. Data entered in the 'Commcare' app were downloadable in excel format which was checked for data quality and consistency. Data analysis was done using Statistical Package for Social Sciences (SPSS) version 16.0. Operational definition used for defining vaccine hesitancy in this study is anyone who has not vaccinated yet despite their willingness to get vaccinated. Willingness to vaccination is considered if the individuals give an affirmative reply to the question, "Are you willing to get vaccinated in the future?". If the individuals had given answered 'no' to the above question, they were considered as 'vaccine refusal'. Institutional ethics clearance was obtained for the conduct of the study.

## RESULTS

The total sample size covered was 2855. The mean age of the study population was 44.6years with standard deviation of 15.7 years. There was almost equal distribution in terms of gender and locality. (Table1).

Ninety-two percent of people were aware of the Covid-19 vaccination with Television being the major source of information. (Table 2)

Excluding 5 members for whom data on vaccination status was missing, among 2850 individuals, 36.8% had got vaccinated of whom 8.7% had completed two doses. (Table 3) The most common reason quoted by those who got vaccinated was 'to prevent disease'. (Table.5) Among the study population, 1802(63.2%) were non-vaccinated. Among vaccinated,

Table 1: Demographic characteristics of the study population

Demographic variable		Frequency (%)
Age Group	18-45 years	1596 (55.9)
	45-60 years	771 (27)
	>60 years	488 (17.1)
Gender	Men	1401 (49.1)
	Women	1453 (50.9)
	Others	1 (0.1)
Locality	Urban	1498 (52.5)
	Rural	1357 (47.5)
Among women(n-1453)	Pregnant	20 (1.4)
	Lactating	58 (4)
Marital status	Married	2376 (83.2)
	Divorced	3 (0.1)
	Separated	7 (0.2)
	Unmarried	322 (11.3)
	Widowed	147 (5.1)
Education	Illiterate	583 (20.4)
	Primary	583 (20.4)
	High School	718 (25.1)
	Higher Secondary	299 (10.5)
	Graduate	514 (18)
	Professional	45 (1.6)
	Occupation	Government
Homemaker		644 (22.6)
Private		639 (22.4)
Retired		100 (3.5)
Self Employed		723 (25.3)
Student		85 (3)
Unemployed		414 (14.5)

Overall vaccine hesitancy and vaccine refusal was reported by 51.2% and 12% respectively. (Figure.1)

Table 2: Awareness towards Covid-19 vaccine among study population (n- 2855)

Knowledge of vaccine availability	2630 (92.1%)
Source of Information	
Relatives	611 (23.2%)
Friends	406 (15.4%)
Colleagues	188 (7.1%)
Television	1267 (48.2%)
Newspaper	436 (16.6%)
Social Media	542 (20.6%)
Health staff	764 (29%)
Other sources	79 (3%)

Table 3: Vaccination Status among study population (n-2855)

Vaccination status	Frequency (%)
Vaccinated	1048 (36.7)
Only 1 dose	802 (28.1)
Completed 2 doses	246 (8.6)
Not Vaccinated	1802 (63.1)
Missing	5 (0.2)

The most common reason quoted for initial hesitancy among vaccinated was ‘fear of injection’, ‘fear of complications’, ‘difficulty in registering in Cowin app’ and ‘unaware of vaccine’. (Table 6) Among people who did not get vaccinated, the most common reasons quoted for hesitancy was ‘fear

of injection’, ‘fear of complications’, ‘complacency-that they would not get Covid’ ‘was told that there is a shortage of vaccine’ and ‘unaware of place of vaccination’. (Table 6)

Table 4: Place of Vaccination among vaccinated

Place of vaccination	1 <sup>st</sup> dose (n- 1048)	2 <sup>nd</sup> dose (n-246)
Government	968 (92.4%)	225 (91.4%)
Private	43 (4.1%)	14 (5.6%)
Workplace	37 (3.5%)	7 (2.8%)

Table 5 :Reason for getting vaccinated#(n-1048)

Reason for getting vaccinated	Frequency# (%)
Prevents disease	868 (82.8)
Prevents Spread	248 (23.7)
Mandate at workplace	125 (11.9)
Compulsion from family friends	45 (4.3)
Requirement for travel	35 (3.3)

(#- multiple options were selected)

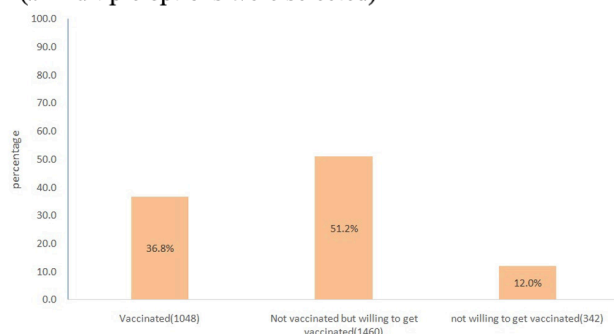
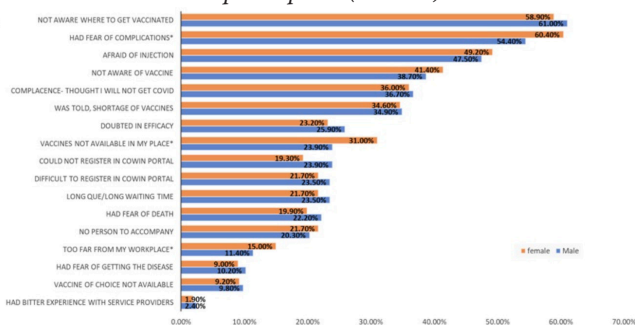


Figure 1: Covid-19 vaccination status among study participants (n=2850)



\*- p value significant at <0.05

Figure 2: Gender differences in factors determining vaccine hesitancy

Table 6: Factors determining vaccine hesitancy#

Reason for vaccine hesitancy	Among vaccinated (n-238)	Among non-vaccinated (n-1802)
Presence of initial vaccine hesitancy among vaccinated (n-1048)	<b>238 (22.7%)</b>	
<b>Convenience</b>		
No person to accompany	53 (23.3%)	379 (21%)
Too far from my workplace	26 (10.9%)	240 (13.3%)
Long que/long waiting time	28 (11.8%)	406 (22.5%)
The vaccine of choice is not available	21 (8.8%)	172 (9.5%)
Afraid of injection	<b>129 (54.2%)</b>	<b>872 (48.4%)</b>
<b>Confidence</b>		
Doubted in efficacy	63 (26.5%)	441 (24.5%)
Had fear of complications	<b>131 (55%)</b>	<b>1038 (57.6%)</b>
Had fear of death	47 (19.7%)	377 (20.9%)
Had fear of getting the disease	24 (10.1%)	172 (9.5%)
<b>Complacence- thought I will not get COVID</b>	<b>64 (26.9%)</b>	<b>655 (36.3%)</b>
<b>Service provider challenges</b>		
Difficult to register	<b>86 (36.1%)</b>	406 (22.5%)
Could not register in Cowin portal	49 (20.6%)	387 (21.5%)
Vaccines not available in my place	26 (10.9%)	499 (27.7%)
Was told, shortage of vaccines	42 (17.6%)	<b>626 (34.7%)</b>
Thought not a priority group	24 (10.1%)	-
Had bitter experience with service providers	14 (5.9%)	38 (2.1%)
<b>Awareness issues</b>		
Not aware of vaccine	<b>113 (47.5%)</b>	724 (40.2%)
Not aware where to get vaccinated	100 (42%)	<b>1079 (59.9%)</b>
<b>Had got covid infection previously</b>	<b>28 (11.8%)</b>	<b>117 (6.5%)</b>

(#- multiple options were selected )

Among people who are not willing to get vaccinated at all, the most common reason quoted was complacency that 'I will not get Covid infection' followed by 'fear of injection', 'fear of complications', 'no person to accompany' and registering in 'Co-win app a complicated process. (Table.7)

Cross tabulation showed that a higher proportion of men, living in urban localities and belonging to the age group 45-60 years got vaccinated compared to their counterparts. (p-value <0.005) (Table. 8) However, among non-vaccinated, there was no statistically significant difference between gender and locality based on willingness to get vaccinated. People aged >60 years reported a higher proportion of non-willingness compared to other age-group which was statistically significant. (p-value <0.001) (Table .9)

Table 7 : Reason for Vaccine refusal# (n-342)

<b>Complacency</b>	
I will not get the Covid disease	<b>275 (80.4%)</b>
Covid is not a big disease	65 (19%)
I got infected with Covid	11 (3.2%)
<b>Confidence</b>	
Afraid of injection	<b>163 (47.7%)</b>
Fear of complications	<b>146 (42.7%)</b>
Fear of death	94 (27.5%)
Fear of getting Covid	12 (3.5%)
Doubt in efficacy	23 (6.7%)
<b>Convenience</b>	
Too far from my place	61 (17.8%)
No person to accompany	<b>88 (25.7%)</b>
Long queue	45 (13.2%)
Long waiting time	32 (9.4%)
The vaccine of choice is not available	20 (5.8%)
Loss of wages	74 (21.6%)
Timing not suitable	57 (16.7%)
Not available on holidays	3 (0.9%)
<b>Service provider gaps</b>	
Cowin app complicated process	<b>158 (46.2%)</b>
Irregular supply	80 (23.4%)
Vaccine shortage	100 (29.2%)

Table 8 : Cross tabulations between demographic factors and vaccination status

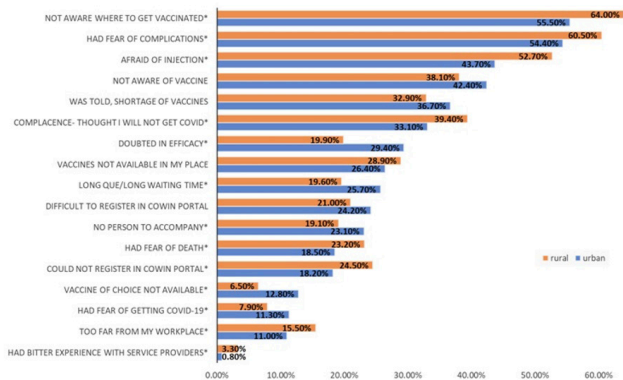
Demographic factor	Vaccinated	Non -vaccinated	Chi-square	p-value
<b>Gender</b>				
Male	566 (40.4%)	834 (59.6%)	15.716	<0.001*
Female	482 (33.3%)	967 (66.7%)		
<b>Locality</b>				
Urban	629 (42%)	867 (58%)	37.665	<0.001*
Rural	419 (30.9%)	935 (69.1%)		
<b>Age Group</b>				
18-44 years	543 (34.1%)	1050 (65.9%)	12.545	0.002*
45-60 years	319 (41.4%)	451 (58.6%)		
>60 years	186 (38.2%)	301 (61.8%)		

\*p value significant at <0.05

Table 9 : Cross tabulations between demographic factors and willingness to get vaccinated

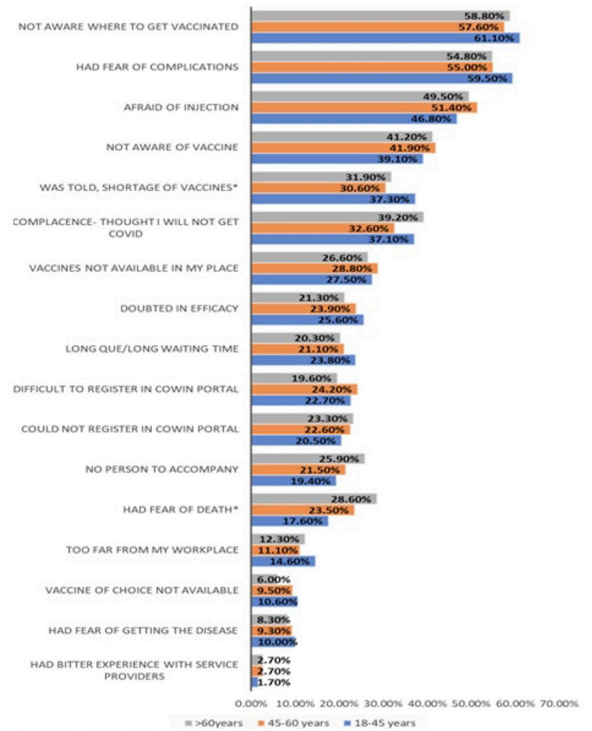
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\*p value significant at <0.05



\*- p value significant at <0.05

Figure 3 : Urban Rural difference in factors determining vaccine hesitancy



\*- p value significant at <0.05

Figure 4 : Age difference in factors determining vaccine hesitancy

## DISCUSSION

Vaccine coverage among this study population is 36.7%. This study reported vaccine hesitancy of 51.2%, which includes people who have not been vaccinated yet. Overall, 12% of the study population were not willing to get vaccinated (vaccine refusers). The results are comparable to the study conducted among Egyptian medical students which showed 35% acceptance among students, 46% were hesitant, and 19% refused. Among Indian Medical students, vaccine hesitancy was found among 10.6%.<sup>5</sup> A study which was published in the Nature journal examined vaccine acceptance and hesitancy rates in low and middle countries from Asia, Africa, and South America. This study revealed that willingness to get vaccines was considerably high in developing countries compared to that of developed countries.<sup>6</sup>

This study also reported that almost 92% of the study participants were aware of the Covid vaccine. Television was the most common source of information which is similar to the finding in a study conducted in the United States.<sup>7</sup> There was a significant difference between vaccinated and non-vaccinated based on gender, locality of residence, and age group. However, there was no significant difference based on gender and locality of residence on willingness to get vaccinated. The finding is like the findings from other studies

which reported that men were more willing to get vaccinated compared to women. A study done in the general public of the UK found that 21.0% of women were vaccine-hesitant compared to 14.7% of male participants.<sup>8</sup> Similarly in an on-line survey conducted by Maria CORDINA et al, found that males were more willing to take the vaccine.<sup>9</sup>

The age-wise difference in vaccine acceptance was observed in this study, with a higher proportion of people in 45-60 years got vaccinated compared to other age groups. However, a larger proportion of adults aged >60 years were refusing to get vaccinated compared to other age groups. Mixed evidence is seen across studies concerning the relationship between age group and vaccine hesitancy. In the study done by Maria Cordina et al, people of 40 to 49 years were hesitant to take vaccine while those >60 years were intending to take the vaccine.<sup>9</sup> In the comparison study between Low Middle Income Countries (LMIC) and High Income Countries (HIC), showed a mixed response between countries. In India and Nigeria, respondents younger than 25 years of age are significantly less willing to take the vaccine compared to adults who are 25–54 years old, while in Mozambique and Rwanda, respondents under 25 years are significantly more accepting compared to those 55 years and over. In the United States and Russia, older respondents have consistently more acceptance than younger respondents.<sup>10</sup>

Among the study participants, 36.7% had received at least one dose of vaccine. The most common reason quoted by the study participants for accepting vaccines was it prevents disease followed by prevention of the spread of infection. This finding is in line with the finding from the study conducted in LMIC wherein the most given reason for vaccine acceptance was personal protection against COVID-19 infection followed by protecting the family.<sup>10</sup> This is very similar to the most common reason quoted by the Egyptian medical students 'Fear of being infected or infecting family with, especially parents who were willing to get vaccinated.'<sup>4</sup>

In this study, 22.7% of participants who got vaccinated reported initial hesitancy. The most common reason for such hesitancy was fear of complications followed by fear of injection and lack of awareness of the vaccine. Among non-vaccinated, unawareness of where to get vaccinated was the most common reason quoted for not getting vaccinated, followed by fear of complications and fear of injection. This finding is unique to this study, as the most common reason stated for low uptake of Covid vaccines among the public in other studies were concerns about long term effects, side effects, and unknown future effects on health.<sup>4,9-11</sup>

Stratified analysis based on gender, urban-rural locality, and age group disclosed key nuances which were otherwise not considered. There was a significant difference between gender for the factors, 'fear of complications', 'vaccine not available in my place', 'too far away from my workplace'. All these factors were significantly high among women, pointing to the fact that proximity to vaccination centres is a key determinant for improving the vaccination coverage among women. More women reported fear of complications compared to men, which needs to be addressed. The IEC campaigns with contents targeting complications and adverse effects following vaccination should be publicized. Media platforms which is largely seen by the women population should be chosen to create awareness.

The urban-rural difference was observed in the reasons quoted for vaccine hesitancy. Compared to the urban population, a significantly higher proportion of rural people had reported confidence-related issues like 'fear of complications', 'fear of death', 'afraid of injection'. Similarly, a significantly higher proportion of rural people had reported 'unawareness on where to get vaccinated', 'inability to register in Cowin portal' and 'too far off from workplace'. A larger number of the rural population have had a bad experience with service providers which prevented them from getting vaccinated. All these are pointing to the fact that sufficient information regarding the vaccine is yet to reach rural population and its adverse effects overshadowing benefits. Information on place of vaccination which is very crucial was also found lacking. COWIN portal, which is the national portal used for registering for vaccination doesn't mandate prior registration as people can walk in and do on-spot registration. However, registering in the COWIN portal was considered a potential barrier as people lacked information regarding 'walk-in sessions.'

On the other hand, a significantly larger proportion of the urban population 'doubted the efficacy of the vaccine and feared Covid infection following injection as the reason for non-vaccination. Also 'non-availability of vaccine of their choice' was reported significantly higher among urban population compared to their rural counterparts. These findings point out that the urban population's access to information is high compared to rural.

Age group difference disclosed that a larger proportion of the adult population aged >60 years reported 'fear of death' as the reason for vaccine hesitancy. In contrast, the younger age group reported 'information on shortage of vaccines' as the reason for vaccine hesitancy.

Among vaccine refusers, (ie who are not willing to get vaccinated) complacency that they will not get Covid infection is the most common reason quoted followed by fear of injection and complications following vaccination. A similar finding was found in a developed country like the USA, where some hesitant respondents cite lack of concern about COVID-19 infection as a reason not to be vaccinated.<sup>10</sup>

'One size fits all strategy will not work as this study pointed out that there are differences in the reasons quoted for non-vaccination based on gender, locality, and age-group. Hence interventions that are customized to address these differences should be made to ensure that the right information is disseminated to a larger population using different media platforms.

The strength of this study is a sample taken in all the districts making the results generalizable to the entire state. Stratum-specific analysis on reasons quoted for non-vaccination enables further framing specific strategies to increase the uptake.

## CONCLUSION

Unvaccinated people not only put themselves at risk but also the people around them. In the absence of large-scale vaccination, the coronavirus will remain a challenge. A targeted approach should be followed to combat hesitation and further increase acceptance among people.

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