

# A Cross Sectional Study on Assessment of Beliefs and Barriers Associated with Covid-19 Vaccination Among South Indian Population

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**Abstract— Background:** Developing a vaccine against COVID-19 is seen as a critical tactic for bringing the pandemic to an end. However, public acceptance is dependent on the vaccine's beliefs and perception. As a result, the study attempted to analyse views and hurdles to COVID-19 immunisation among South Indian population. **Methods:** An online self-administered questionnaire addressed socio-demographic factors, beliefs about COVID-19 immunization, and potential barriers that could prevent people from getting vaccinated. Descriptive analysis was performed on the relationship between COVID-19 vaccination acceptability and sociodemographic factors. **Results:** In the comparison of demographic variables with beliefs and barriers to COVID-19 vaccination, 413 participants from South India were included. According to the findings of this study 86.3% received vaccination, despite a shortage of COVID-19 vaccines across all of South India's states. The data also demonstrated that the beliefs towards COVID-19 vaccination among South Indian population were higher than barriers for vaccination. **Conclusion:** As evidenced by this study, there has been a rise in beliefs associated with COVID-19 vaccines, with an increasing number of people receiving the vaccination in South India. Furthermore, the study offered insight into potential reasons for vaccine delays and barriers. The findings may also help to reduce skepticism and promote acceptance. In conclusion, India is on the right trajectory in its fight against further spread COVID-19.

**Keywords—** COVID-19, COVID-19 vaccination, Questionnaire, South India.

## I. INTRODUCTION

Coronavirus disease 2019 (COVID-19), a highly contagious viral illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has wreaked havoc on the world's demographics, killing more than 3.8 million people worldwide and establishing itself as the most serious global health crisis since the 1918 influenza pandemic prompting the World Health Organization (WHO) to designate it a worldwide pandemic on March 11, 2020<sup>[1]</sup>. COVID-19 has destroyed several nations and overloaded many healthcare systems since it was designated a global pandemic<sup>[2]</sup>. Data acquired from various clinical trials from different countries have yielded unsatisfactory results concerning use of repurposed existing drugs like Remdesivir, Hydroxychloroquine, Lopinavir and Interferon alfa in treatment of COVID-19<sup>[3]</sup>. Thus, the needs for preventive strategies have led to development of vaccines<sup>[4]</sup>. Various clinical researchers have since then rapidly started fast-track developing vaccines to protect the population from further exposure and suffering from the virus and its mutant strains such as that has ravaged communities around the world<sup>[5]</sup>. A number of vaccine candidates have since then emerged for development of efficacious vaccines to contribute for herd immunity in general population<sup>[6-8]</sup>. Some of the notable vaccines that have been approved by various drug administration's around the world are: Pfizer/BioNTech Comirnaty vaccine, Covaxin by Bharat Biotech, SII/Covishield and AstraZeneca/AZD1222 vaccines

(developed by AstraZeneca/Oxford and manufactured by the Serum Institute of India and SK Bio respectively), Janssen/Ad26.COV 2.S developed by Johnson & Johnson, Moderna COVID-19 vaccine (mRNA 1273), Sputnik V by Gamaleya Research Institute, Sinopharm COVID-19 vaccine produced by Beijing Bio-Institute of Biological Products Co Ltd<sup>[9-14]</sup>. ZyCoV-D by Zydus Cadila, acknowledged as world's first DNA vaccine, was also approved by India in the month of August 2021 for immunization despite being in early stages of clinical trials<sup>[15, 16]</sup>. However, Covaxin, Covishield and Sputnik V are currently used in India with the country registering a tremendous achievement of administering 150 crore first doses in a population of 1380 million (as of 2020). Despite this attainment, the threat of vaccine hesitancy seems to loom over the prospect of attaining herd immunity. The term "vaccine hesitancy" refers to delaying or refusing vaccination despite the availability of vaccination services, i.e., there is no desire for provided and available vaccinations<sup>[17]</sup>. Developing a safe, effective, and inexpensive vaccine is difficult enough, but vaccine hesitancy presents researchers, scientists, government officials, and community leaders with a new and distinct challenge<sup>[18]</sup>. Up till May 2022, India had produced around approximately 100 million Covishield doses and 10 million Covaxin doses each month<sup>[19]</sup>. This rate of production may, however, prove to be insufficient to serve India's massive population<sup>[18]</sup>. Because a high coverage rate is necessary to transmit herd immunity, which is required to flatten the epidemic curve, such logistical factors and vaccine anxiety affects the hesitant person and, as

a result, the entire community [20].Lack of faith in COVID-19 vaccinations causes direct and indirect health risks and might undermine efforts to end the current pandemic[21]. Although lack of vaccine awareness remains primary reason for vaccine hesitancy, concerns differ across various population strata [22]. Thus, the study aims to understand core beliefs and barriers associated with COVID-19 vaccination among south Indian population whilst also assessing the reason for vaccination hesitancy.

II. AIM AND OBJECTIVE:

The aim of the study is to assess the beliefs and barriers associated with COVID-19 vaccination among the South Indian population. The objectives of the study were to know the causes of barriers involved in COVID-19 vaccination, obtain socio-demographic variables regarding COVID-19 vaccination and generate information for the betterment of vaccination strategy.

III. METHODOLOGY

*Study Design:* Cross-sectional observational study.

*Study Site:* The study was conducted online through a self-administered questionnaire (Google forms) in South India (Tamil Nadu, Andhra Pradesh, Kerala, Karnataka and Telangana).

*Study Duration:* 6 months

*Study Population:* General population from South India (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, and Telangana) who filled the Google forms.

*Sample Size:* 413

*Study Criteria:*

*Inclusion criteria:*

- Male, female
- Age: Above 18.
- Those willing to give informed consent.
- Participants with internet access.
- Pregnant and lactating women.
- Participants who know English.

*Exclusion criteria:*

- Age: Below 18.
- Those not willing to give informed consent.
- Participants without internet access.
- Participants who know only regional language.
- North Indian states

*Study Procedure:*

A Cross-sectional survey was conducted to assess the significant impact of COVID-19 vaccination among South Indian population. An online data collection tool (Google forms) was used to collect data in this current study. The questionnaire consisted of an electronic consent form and a set of questions regarding demographic details, beliefs, and barriers of COVID - 19 vaccinations. The questionnaire was circulated through social media platforms like WhatsApp, Facebook, Instagram, Telegram and LinkedIn. Based on the response from the participants, data was assessed.

*Statistical Analysis:*

• *Study Variables of Data*

The study parameters in the data were age, gender, the existence of co-morbid conditions, and the perception among participants on COVID-19 vaccination (beliefs and barriers).

• *Analysis of Data*

Compilation of data was done.

- Data were classified into different independent variables.
- The data were tabulated using Microsoft excel and analysed descriptively.

*Validation of Questionnaire*

Belief and Barriers Covid-19 vaccination Questionnaire (BBCovid-19Q) was developed and validated. (BB Covid-19Q) was circulated through Google forms to collect the required information. The generation of the item in the questionnaire was done. Pretest, pilot-tests were performed with samples of 14 and 30 respectively. Cronbach's alpha was used to establish reliability of the questionnaire. Readability of the questionnaire item was measured by the following online test tools.

- Flesch–Kincaid readability tests designed to indicate how difficult a reading passage in English is to understand
- The Gunning fog index measures the readability of English writing
- The Coleman–Liau index designed to gauge the understandability of a text
- The Simple Measure of Gobbledygook (SMOG) is a measure that estimate the years of education needed to understand
- The automated readability index (ARI) designed to gauge the understandability of a text.

Finally, the average grade level of these tests was taken into account. These tests (table 1) were done using free online readability calculator.

TABLE 1: Validation tests

Criteria	Description
Name	BBCovid-19Q
Purpose	Belief and barriers associated with Covid-19 vaccination in South Indian population
Research Question	Research questions were identified and finalized by pre-test and pilot test
Scale	Likert, yes or no and multiple option
Generation of items	Items generated from experts, underlying theoretical structure and literature review
Pilot of items	Pilot work:30 respondents
Readability	Flesch–Kincaid Gunning fog index Coleman–Liau index SMOG Grade ARI
Reliability	Cronbach’s alpha for each domain > 0.77

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Fig. 1: Criteria for Cronbach's alpha

TABLE 2: Cronbach's alpha results

Average interitem covariance	Number of items in the scale	Scale reliability coefficient	Internal consistency
0.121	24	<b>0.77</b>	Acceptable

#### IV. RESULTS

A total of 413 responses were recorded. They were classified according to demographic details like age, gender, state, education, and residential area. The demographic details were then further used to compare beliefs (+ve responses) and barriers (-ve responses) in terms of percentage of responses. This was done to identify crucial barrier parameters for vaccination acceptance.

*Comparison Of Demographic Variables with Beliefs (+<sup>ve</sup> Response) And Barriers (-<sup>ve</sup> Response) Towards Covid-19 Vaccination:*

##### 1. Vaccine Conspiracy

The following table (table 3) shows distribution of responses towards 'Vaccine conspiracy':

##### 2. Vaccine Shortage:

The following table (table 4) shows distribution of responses towards 'vaccine shortage':

##### 3. Fear Of Reinfection:

The following table (table 5) shows distribution of responses towards 'Fear of reinfection':

##### 4. Difficulty in Vaccination Registration Process:

The following table (table 6) shows distribution of responses towards 'Difficulty in vaccine registration process':

##### 5. I Can Manage Covid-19 Without Vaccine:

The following table (table 7) shows distribution of responses towards 'I can manage COVID-19 without vaccine':

##### 6. Fear of Needles:

The following table (table 8) shows distribution of responses towards 'Fear of needles':

##### 7. I Am Young and Healthy and "I Don't Need Vaccination":

The following table (table 9) shows distribution of responses towards 'i am young and healthy and "i don't need vaccination":

#### V. DISCUSSION

Vaccination has proved to be a major game-changer in the fight against the novel Coronavirus. India had first approved COVID-19 vaccines (Covaxin and Covishield) in the month of January 2021. As of March 2022, more than 170 crores of the

first dose vaccines had been administered making it a tremendous feat of achievement. Our results validate this statement with 86.3% of our study population had been vaccinated with at least one dose. A total of 44.16% of participants had received the first dose whilst 55.83% had received the second dose. The study revealed that 61.94% preferred Covishield while 40.84% preferred Covaxin and 3.33% preferred Sputnik-V. Many believed that vaccination is the solution for Covid-19 (26.37%), while some believed it is safe and effective (19.42%). Some participants (15.34%) received vaccination because they were recommended to do so whilst 6.23% of the participants were insisted by the organization. Many participants (51.30%) believed that vaccination may eventually help to get rid of masks. Despite increased acceptance of vaccination, 23.70% of the study population believed that religious belief prevents people from receiving the vaccination. Nearly 73.60% of participants believed that two doses were required to boost immunity against COVID-19. We observed that 97.80% of the study population was well aware of COVID-19 vaccination by modes of Television/Radio (39.80%), social media (30.50%), Newspaper (17.30%), Friends and family (12.50%). In the unvaccinated population (13.70%), 4.32% had refused vaccination due to fear of side effects, 2.88% refused because of age and 2.64% refused due to lack of transparency about vaccination. We considered 413 participants for our comparison of beliefs and barriers in South India (Tamil Nadu, Kerala, Andhra Pradesh, Telangana, and Karnataka). We noticed that many individuals in Tamil Nadu believed that vaccine shortages were a barrier to immunization, but many in Andhra Pradesh believed that vaccination was a conspiracy. Many people in Telangana and Karnataka believed they could manage with COVID-19 without vaccination. In comparison to other states, Kerala had a large number of people who were afraid of needles. Beliefs were stronger in urban residential areas of the states than in rural regions. Our study demonstrated that 86.3% had received vaccination which is in accordance with the results of the study conducted in India by Sharun Khan *et al.* (2020) where the vaccine acceptance rate was found to be 86.3%.<sup>[23]</sup> In the study conducted in Saudi Arabia by Magadmi *et al.* (2020), the results demonstrated a 44% rate of vaccine acceptance which is almost half the percentage lower than the results obtained in this study which proves that there is an increase in vaccine acceptance amongst people.<sup>[24]</sup> In the study conducted by İkişik H *et al.* (2021) in a district in Istanbul, vaccine hesitancy was found to be 45.3% which was higher than the results obtained in our study (13.7%).<sup>[25]</sup> However, both the studies from Saudi Arabia and Istanbul were conducted before the availability of vaccines while this study was conducted after the availability of vaccines. Hence, there is a possibility of change in perception towards vaccines over a period of time.

#### VI. CONCLUSION

As evidenced by this study, there has been a rise in beliefs associated with COVID-19 vaccines, with an increasing number of people receiving the vaccination in South India. Furthermore, the study offered insight into potential reasons

for vaccine delays and barriers. It also demonstrated conviction and faith in immunization against COVID-19. The findings may also help to reduce skepticism and promote acceptance. In conclusion, India is on the right trajectory in its fight against prevention of further spread of COVID-19.

**Abbreviations:**

COVID-19: Coronavirus disease 2019, SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2, WHO: World Health Organization, SMOG: Simple Measure of Gobbledygook, ARI: automated readability index, +ve responses: Positive responses, -ve responses: Negative responses, Belief and Barriers Covid-19 vaccination Questionnaire (BBCovid-19Q).

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Electronic consent was obtained from the participants.

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Not applicable

**Competing interests:**

Authors declare no conflicts of interest.

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TABLE 3: Vaccine Conspiracy Distribution

Demographic Variable	Response Towards Covid-19 Vaccine	Barriers (-ve Response) Towards COVID-19 Vaccination		Beliefs (+ve Response) Towards COVID-19 Vaccination	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
AGE	Vaccine Conspiracy	35	8.47%	146	35.35%
18-44		17	4.11%	54	13.07%
44-59		13	3.14%	65	15%
Above 60		MEAN	5.24%	MEAN	21.14%
GENDER					
Male		33	7.99%	127	30.75%
Female		30	7.26%	136	32.92%
Not available		2	0.48%	2	0.48%
		MEAN	5.243%	MEAN	21.3%
STATE					
Tamil Nadu		12	2.91%	77	18.64%
Andhra Pradesh		21	5.08%	40	9.69%
Telangana		12	2.91%	50	12.11%
Kerala		8	1.94%	48	11.62%
Karnataka		12	2.91%	50	12.11%
		MEAN	3.15%	MEAN	12.8%
RESIDENTIAL AREA					
Urban		48	11.62%	53	51.33%
Rural		17	4.11%	212	12.83%
		MEAN	7.8%	MEAN	32.08%
<b>TOTAL MEAN</b>		21.43%		87.32%	

Note: This data reveals that the conspiracy towards COVID-19 vaccination among South Indian population were not a potential barrier for COVID-19 vaccination.

TABLE 4: Vaccine Shortage Distribution

Demographic Variable	Response Towards Covid-19 Vaccine	Barriers (-ve Response) Towards COVID-19 Vaccination		Beliefs (+ve Response) Towards COVID-19 Vaccination	
		Frequency(n)	Percentage (%)	Frequency(n)	Percentage (%)
AGE	Vaccine Shortage	169	40.92%	55	13.32%
18-44		39	9.44%	27	6.54%
44-59		44	10.65%	29	7.02%
Above 60		MEAN	20.33%	MEAN	8.96%
GENDER					
Male		105	25.42%	60	14.53%
Female		146	35.35%	49	11.86%
Not available		1	0.24%	2	0.48%
		MEAN	20.3%	MEAN	8.9%
STATE					
Tamil Nadu		76	18.40%	29	7.02%
Andhra Pradesh		41	9.93%	21	5%
Telangana		47	11.38%	18	4.36%
Kerala		39	9.44%	21	5.08%
Karnataka		49	11.86%	22	5.33%
		MEAN	12.20%	MEAN	5.35%
RESIDENTIAL AREA					
Urban		212	51%	87	21.07%
Rural		40	10%	24	5.81%
		MEAN	30.5%	MEAN	13.44%
<b>TOTAL MEAN</b>		83.3%		36.65%	

Note: This data reveals that the shortage of COVID-19 vaccine is higher in all the states of South India.

TABLE 5: Fear of Reinfection Distribution

Demographic Variable	Response Towards Covid-19 Vaccine	Barriers (-ve Response) Towards COVID-19 Vaccination		Beliefs (+ve Response) Towards COVID-19 Vaccination	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
AGE	Side Effects of Vaccine, Report of Death After Vaccination, Fear of Reinfection				
18-44		13	3.14%	226	54.72%
44-59		5	1.21%	83	20.09%
Above 60		6	1.45%	80	19.37%
		MEAN	1.93%	MEAN	31.39%
GENDER					
Male		13	3.14%	180	43.58%
Female		11	2.66%	204	49.39%
Not available		0	0%	5	1.21%
		MEAN	1.9%	MEAN	31.39%
STATE					
Tamil Nadu		0	0%	114	27.60%
Andhra Pradesh		8	1.93%	64	15.49%
Telangana		4	0.96%	70	16.94%
Kerala		5	1.21%	66	15.98%
Karnataka	7	1.69%	75	18.15%	
	MEAN	1.15%	MEAN	18.82%	
RESIDENTIAL AREA					
Urban	18	4.35%	315	76.27%	
Rural	6	1.45%	74	17.91%	
	MEAN	2.9%	MEAN	47.09%	
<b>TOTAL MEAN</b>		7.8%		128.69%	

Note: This data showed that the side effects, report of death after vaccination, fear of re-infection were not a potential barrier for COVID-19 vaccination among South Indian population

TABLE 6: Difficulty in Vaccination Registration Process Distribution

Demographic Variable	Response Towards Covid-19 Vaccine	Barriers (-ve Response) Towards COVID-19 vaccination		Beliefs (+ve Response) Towards COVID-19 vaccination	
		Frequency(n)	Percentage (%)	Frequency(n)	Percentage (%)
AGE	Difficulty in Vaccination Registration Process				
18-44		57	13.80%	173	41.88%
44-59		33	7.99%	45	10.89%
Above 60		26	6.29%	50	12.10%
		MEAN	9.36%	MEAN	21.6%
GENDER					
Male		51	12.34%	135	32.68%
Female		64	15.49%	130	31.47%
Not available		1	0.24%	3	0.72%
		MEAN	9.35%	MEAN	21.6%
STATE					
Tamil Nadu		22	5.33%	89	21.55%
Andhra Pradesh		29	7.02%	35	8.47%
Telangana		21	5.08%	49	11.86%
Kerala		26	6.30%	41	9.93%
Karnataka	18	4.36%	54	13.08%	
	MEAN	5.6%	MEAN	12.9%	
RESIDENTIAL AREA					
Urban	27	6.53%	228	55.20%	
Rural	89	21.54%	40	9.68%	
	MEAN	14.03%	MEAN	32.44%	
<b>TOTAL MEAN</b>		38.34%		88.54%	

Note: This data revealed that the difficulty in vaccine registration process is higher in Andhra Pradesh than other South Indian states.

TABLE 7: I Can Manage Covid-19 Without Vaccine Distribution

Demographic Variable	Response Towards Covid -19 Vaccine	Barriers (-ve Response) Towards COVID-19 Vaccination		Beliefs (+ve Response) Towards COVID-19 Vaccination	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
AGE	I Can Manage COVID-19 Without Vaccine	37	8.95%	202	48.91%
18-44		19	4.60%	69	16.70%
44-59		18	4.35%	68	16.46%
Above 60		MEAN	5.96%	MEAN	27.35%
GENDER					
Male		36	8.71%	157	38.01%
Female		37	8.95%	178	43.09%
Not available		1	0.24%	4	0.96%
		MEAN	5.96%	MEAN	27.35%
STATE					
Tamil Nadu		10	2.42%	104	25.18%
Andhra Pradesh		18	4.35%	54	13.07%
Telangana		17	4.11%	57	13.80%
Kerala		11	2.66%	60	14.52%
Karnataka		18	4.35%	64	15.49%
	MEAN	3.57%	MEAN	16.41%	
RESIDENTIAL AREA					
Urban	52	12.59%	281	68.03%	
Rural	22	5.32%	58	14.04%	
	MEAN	8.95%	MEAN	41.03%	
<b>TOTAL MEAN</b>		24.44%		112.14%	

Note: This data showed that the management of COVID-19 is not possible without the COVID-19 vaccination.

TABLE 8: Fear of Needles Distribution

Demographic Variable	Response Towards Covid -19 Vaccine	Barriers (-ve Response) Towards COVID-19 Vaccination		Beliefs (+ve Response) Towards COVID-19 Vaccination	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
AGE	I Can Manage COVID-19 Without Vaccine	37	8.95%	202	48.91%
18-44		19	4.60%	69	16.70%
44-59		18	4.35%	68	16.46%
Above 60		MEAN	5.96%	MEAN	27.35%
GENDER					
Male		36	8.71%	157	38.01%
Female		37	8.95%	178	43.09%
Not available		1	0.24%	4	0.96%
		MEAN	5.96%	MEAN	27.35%
STATE					
Tamil Nadu		10	2.42%	104	25.18%
Andhra Pradesh		18	4.35%	54	13.07%
Telangana		17	4.11%	57	13.80%
Kerala		11	2.66%	60	14.52%
Karnataka		18	4.35%	64	15.49%
	MEAN	3.57%	MEAN	16.41%	
RESIDENTIAL AREA					
Urban	52	12.59%	281	68.03%	
Rural	22	5.32%	58	14.04%	
	MEAN	8.95%	MEAN	41.03%	
<b>TOTAL MEAN</b>		24.44%		112.14%	

Note: This data shows fear of needles is not a barrier for COVID-19 vaccination among South Indian population.

TABLE 9: I Am Young and Healthy and “I Don’t Need Vaccination” Distribution

Demographic Variable	Response Towards Covid - 19 Vaccine	Barriers (-ve Response) Towards COVID-19 Vaccination		Beliefs (+ve Response) Towards COVID-19 Vaccination	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
AGE	<b>I Am Young and Healthy and I Don’t Need Vaccination</b>	19	4.60%	220	53.26%
18-44		8	1.93%	80	19.37%
44-59		8	1.93%	78	18.88%
Above 60		MEAN	2.82%	MEAN	30.50%
GENDER					
Male		15	3.63%	178	43.09
Female		19	4.60%	196	47.45%
Not available		1	0.24%	4	0.96%
		MEAN	2.82%	MEAN	30.5%
STATE					
Tamil Nadu		4	0.96%	110	26.63%
Andhra Pradesh		12	2.90%	60	14.52%
Telangana		5	1.21%	69	16.70%
Kerala		4	0.96%	67	16.22%
Karnataka		10	2.42%	72	17.43%
	MEAN	1.69%	MEAN	18.3%	
RESIDENTIAL AREA					
Urban	24	5.81%	309	74.81%	
Rural	11	2.66%	69	16.70%	
	MEAN	4.23%	MEAN	45.7%	
<b>TOTAL MEAN</b>		11.56%		125%	

Note: This data reveals that the beliefs about young age and good health are not a significant barrier towards COVID-19 vaccination among South Indian population.