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Original Article

Public Health Section

COVID-19 Seropositivity among Adults of Tribal Origin Attending a Primary Care Centre in Wayanad Kerala- A Cross Sectional Study

ANIMA RAJ[1], NAVAMI SASIDHARAN[2], ASWATHY SREEDEVI[3], SANJEEV VASUDEVAN[4], V ANIL KUMAR[5], MINU MARIA MATHEW[6]

ABSTRACT

Introduction: Coronavirus Disease-2019 (COVID-19) is a highly contagious viral illness caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Serological surveys help in understanding the burden of past infections. The World Health Organisation (WHO) suggests the need for population-based sero-epidemiological investigations to acquire data for implementing containment measures. The tribal population, being the most marginalised and vulnerable section, is at a higher risk for COVID-19. However, there is limited literature regarding the seroprevalence of COVID-19 among the tribal population in our country.

Aim: To assess the COVID-19 seropositivity, associated factors, and knowledge among adults of tribal origin attending a primary care centre in Wayanad, Kerala.

Materials and Methods: A cross-sectional study was conducted among 279 adults of tribal origin, aged between 18 and 95 years, attending a primary tribal healthcare centre at Amrita Institute of Medical Sciences, Kochi, Kerala, India, from August 2021 to October 2021. A semistructured questionnaire was used to collect socio-demographic details, history of COVID-19 infection, vaccination status, and participants' knowledge and awareness about COVID-19. Antibody presence was tested using the WANTAI test kit. Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 21.0 A multivariable logistic regression was conducted following univariate analysis to identify independent factors associated with COVID-19 seropositivity.

Results: The mean age of the study population was 45.34±15.86 years. Among the 279 participants, the proportion of seropositivity to COVID-19 antibodies was found to be 245 (87.8%) with a 95% confidence interval (CI) of 83.98 to 91.62. Regarding knowledge and awareness related to COVID-19, 186 (66.7%) participants were not aware of the common symptoms of COVID-19. Individuals aged above 60 years had a five times higher probability of having COVID-19 antibodies compared to those aged 30 years or younger (adjusted odds ratio (aOR) 4.71, 95% CI 0.111 to 20.025). Those who had received atleast one dose of the vaccine were nine times more likely to have seropositivity (aOR 8.58, 95% CI 1.390 to 53.028).

Conclusion: The seropositivity of COVID-19 was high at 87.8%. Older people and vaccinated individuals were more likely to be seropositive. Therefore, it is necessary to strengthen vaccination efforts among all age groups. Continued sero-surveillance and vaccination surveys need to be conducted to gain more insights into the antibody kinetics of this novel pathogen.

Keywords: Antibody, Seroprevalence, Vaccination coronavirus disease-2019

INTRODUCTION

COVID-19 is a highly contagious viral illness caused by Severe Acute Respiratory syndrome- Coronavirus- 2(SARS-CoV-2) which has emerged as a global pandemic [1]. However, the immunological response to the infection has remained elusive. There are still gaps in scientific knowledge about the antigenicity of the SARS-CoV-2 strain, the innate and adaptive human immune response to the infection, antibody response, protection from re-infection, and the role of cytokine induction, among others [2]. In India, a nationwide serosurvey was conducted twice, revealing that over 30% of positive cases lacked antibodies [3]. Another study showed that at 20.5 days, 85% of COVID-19 patients developed antibodies [4].

The primary healthcare system aims to provide people with the best possible access to environments, lifestyles, and health services [5]. Throughout the state, thirteen tribal mobile medical units have been operating to provide primary healthcare services to the tribal population residing in remote tribal villages, with five units currently functional in Wayanad district [6].

As of September 13, 2022, India reported 43 million cases and approximately 523,753 deaths, making it the country with the second-highest number of COVID-19 cases in the world [7]. The clinical spectrum of COVID-19 ranged from asymptomatic to severe respiratory symptoms, with significantly higher mortality among immunosuppressed individuals and the elderly with co-morbidities [8]. Although a significant number of COVID-19 infections were asymptomatic, infected persons could still spread the virus to their close contacts.

In 2022, the WHO declared vaccination to be a vital tool for combating the COVID-19 pandemic [9]. To halt the spread of an infectious disease, a sufficient percentage of the population needs to be immune in order to attain herd immunity [10]. Seroprevalence can be contributed to by vaccination and a history of COVID-19 infection [11]. The WHO has suggested the need for population-based sero-epidemiological investigations to determine and implement containment measures. Moreover, serosurveys also help in estimating the percentage of the population vulnerable to infection. Earlier serosurveys in India revealed a seroprevalence of 0.73% in May-June 2020 [12], which increased to 7.1% in August-September 2020 [13].

Scheduled Tribes are the most marginalised and vulnerable section of society, constituting 8.6% of India's and 1.5% of Kerala's population [14]. Wayanad district has the highest number of tribals (1,51,443) in Kerala [15]. Paniyar, Kurichyar, Kattunaikkar, Mullukkurumar, Adiyar, Kanduvadiyar, Thachanadar, and Kanaladi were the tribes found in Wayanad district, as per the report of the Kerala Institute for Research Training & Development Studies of Scheduled Castes and Scheduled Tribes [16]. According to the Ministry of Tribal Affairs and the National

Commission for Scheduled Tribes, the prevalence of COVID-19 among the tribal population had significantly increased during the second wave due to increased exposure [17].

The COVID-19 pandemic has placed a disproportionate burden of disease on the tribal population. Isolation, economic backwardness, lack of access to healthcare facilities, poverty, lack of clean water and sanitation, and lack of language-friendly and culturally appropriate information about COVID-19 are some of the reasons for their increased vulnerability to the pandemic [18]. Considering the vulnerability of the tribal community and the increased number of COVID-19 cases among them, especially during the second wave of the pandemic, the state government vaccinated all tribals above 18 years of age, irrespective of their co-morbidities [19].

According to the Government of Kerala's Serosurveillance report for 2021, the seroprevalence among the entire tribal population of Kerala was 78.2%, while the unvaccinated tribal population had a seroprevalence of 67.1% [20]. This study focussed on Wayanad, among various tribal groups, and considered all the factors specific to that area. There is very limited literature regarding the seroprevalence of COVID-19 among this vulnerable group. Determining seropositivity is particularly important as past infectious disease epidemics and their characteristics predict the evolutionary future [21].

Moreover, several viral clades cause zoonotic jumps and are likely to continue spreading within human populations. For example, SARS-CoV-2 shares 76% of its genome with SARS-CoV-1 [22]. This study is novel as it was carried out among different tribal groups in Wayanad. It was conducted in the district with the highest proportion of tribals, apart from the one done by the Government of Kerala across the state among tribal communities around the same time. Socio-demographic factors such as age, gender, tribal sub-group, educational background, vaccination status, presence of co-morbidities, and previous history of COVID-19 were also assessed as potential determinants of seropositivity in this study. Therefore, the objective of the study was to estimate the COVID-19 seropositivity among adults of tribal origin, determine the factors associated with COVID-19 seropositivity, and assess their knowledge about the disease.

MATERIALS AND METHODS

A cross-sectional study was conducted from August 2021 to October 2021 among adults of tribal origin attending a primary healthcare centre in Wayanad, Kerala, which is also the tribal field practice area of Amrita Institute of Medical Science, Kochi, Kerala, India. A systematic random sampling technique was used to select the study participants. The study was approved by the Institutional Ethical Committee (ECASM-AIMS-2021-387).

Inclusion criteria: Every second patient of tribal origin, aged 18 years and above, attending the outpatient department of the centre during the study period were included.

Exclusion criteria: The patients who tested positive for COVID-19 during the study period were excluded.

Sample size calculation: In a study conducted by the Department of Health and Family Welfare, Government of Kerala, titled "Seroprevalence of SARS CoV-2 IgG antibodies among the population aged ≥18 years in Kerala" [20], the seroprevalence among tribals aged ≥18 years was found to be 78.2%. With a 95% confidence interval and 10% relative precision, the calculated sample size for the study was 108. The authors collected data from 279 individuals of tribal origin for the study over a period of three months.

Questionnaire: A semistructured questionnaire was administered to collect information regarding socio-demographic details such as age, gender, tribal group, education, occupation, and socio-economic status. It also collected COVID-19 vaccination details such as type of vaccination, dose and date of vaccination, delay in taking vaccination, side-effects following vaccination, history of COVID-19 including hospitalisation, adoption of preventive measures or tribal remedies, history of travel or attending social gatherings in the past 14 days, history of contact with COVID-19 patients, and history of co-morbidities. Knowledge items consisted of symptoms of COVID-19, mode of transmission, mask etiquette, COVID-19 appropriate behaviour, willingness to undergo a COVID-19 test, and access to laboratory facilities for testing. The questionnaire was developed by our team after a thorough literature review, and content validity was assessed based on expert opinions. It was pilot tested for reliability and found to be reliable [Annexure-1].

The questionnaire was in English, and the data was collected through interviews conducted in the local language. Reliability was assessed by administering the questionnaire to approximately 10 individuals after the study, and it was found to be reliable.

After obtaining informed consent, 4 mL of blood was drawn from the left arm in a sitting position under strict aseptic precautions. The samples were then transported to the Microbiology laboratory in a thermocol box with an ice pack within four hours of blood collection. The samples were stored at 4ºC until the tests were conducted. Trained personnel in the Microbiology laboratory at Amrita Institute of Medical Sciences performed the antibody tests. The WANTAI SARS-CoV-2 Ab Enzyme-Linked Immunosorbent Assay (ELISA) was used to detect the antibody. This ELISA detects an individual's adaptive immune response (IgG and IgM) to SARS CoV-2, indicating recent or prior infection. Antibodies to SARS-CoV-2 are generally detectable in the blood several days after the initial infection, though the exact duration is not known. The results were communicated to the research participants within two weeks through telephonic communication.

STATISTICAL ANALYSIS

The data was entered into Microsoft Excel, and the Statistical Package for Social Sciences (SPSS) version 21.0. was used for data analysis. Descriptive statistics were expressed as mean and standard deviation. Categorical variables were expressed as frequency and percentage. The chi-square test was used to determine the factors associated with seropositivity to COVID-19. Multiple logistic regression was performed to determine the independent predictors associated with COVID-19 antibody. All variables with a p-value of <0.2 were included in the multivariable analysis.

RESULTS

The study was conducted among 279 participants. The majority, 149 (53.4%), were in the age group of 31-59 years. The mean age (SD) of the population was 45.34±15.86 years. The seroprevalence of the COVID-19 antibody was found to be 245 (87.8%) (95% CI 83.98, 91.62). The majority, 197 (70.6%), of study participants were females, and 180 (64.5%) were from the Paniya tribal group. More than a third, 101 (36.2%), of the study participants had no formal education, and more than half, 150 (53.8%), were engaged in unskilled work. Additionally, 266 (95.3%) of the participants belonged to the below poverty line criteria.

Among the study participants, 269 (96.4%) were vaccinated with atleast one dose of the vaccine, with 227 (81.4%) having received the Covishield vaccine. Furthermore, 158 (56.6%) of the participants had completed both doses of the vaccination schedule. Among those who had taken both doses, 254 (91%) received the second dose of the vaccine without any delay. In the past three months, 25 (9%) of the study participants had a history of COVID-19 infection, and 24 (8.6%) had a history of hospitalisation for COVID-19. Awareness about COVID-19 symptoms was low, with 186 (66.7%) participants not being aware of the common symptoms [Table/Fig-1].

Univariate analysis for the association of seropositivity to the COVID-19 antibody with socio-demographic features, history of COVID-19,

Socio-demographic characteristics		Frequency (n)	Percentage (%)
Age (years)	≤30	59	21.1
	31-59	149	53.4
	≥60	71	25.4
Gender	Male	82	29.4
	Female	197	70.6
Tribal groups	Paniya	180	64.5
	Kuruma	47	16.8
	Others	52	18.6
Education	No formal education	101	36.2
	Primary school	42	15.1
	Middle school	72	25.8
	High school	57	20.4
	Post high school	7	2.5
Occupation	Unemployed	15	5.4
	Unskilled	150	53.8
	Skilled	8	2.9
	Homemaker	102	36.6
	Professional	4	1.4
Socio economic status	APL	13	4.7
	BPL	266	95.3
Vaccine taken (at least 1 dose)	Yes	269	96.4
	No	10	3.6
Name of vaccine	Covishield	227	81.4
	Covaxin	42	52.1
No. of dose taken	One	111	39.8
	Two	158	56.6
Any delay in 2nd dose	Yes	15	5.4
	No	254	91.0
COVID-19 infection in the past 3 months	Yes	25	9.0
	No	254	91.0
Hospitalised due to COVID-19	Yes	24	8.6
	No	255	91.4
Preventive measures are taken other than vaccination	Yes	12	4.3
	No	270	96.7
History of travel in the past 14 days	Yes	3	1.1
	No	276	98.9
History of quarantine	Yes	71	25.4
	No	208	74.6
Have you been in primary contact with COVID-19 patient	Yes	87	31.2
	No	198	68.8
Any of your family members became COVID-19 positive in the last 3 months	Yes	45	16.1
	No	234	83.9
Knowledge about COVID-19 symptoms	Yes	93	33.3
	No	186	66.7
Knowledge about of mode of transmission of COVID-19	Yes	150	53.8
	No	129	46.2
Knowledge about mask etiquette	Yes	94	33.7
	No	185	66.3
COVID-19 appropriate behaviour	Yes	177	63.4
	No	102	36.6
Prevention and control of COVID-19	Yes	140	50.2
	No	139	49.8
Willingness to do COVID-19 test	Yes	229	82.1
	No	50	17.9
Access to laboratory facility for testing	Yes	243	87.1
	No	36	12.9

[Table/Fig-1]: Distribution of the study participants based on socio-demographic characteristics, COVID-19 vaccination, infection details, history of COVID-19 and knowledge regarding COVID-19 (N=279).

COVID-19 exposure, co-morbidities, and multimorbidities are provided in [Table/Fig-2]. Individuals in the ≥60-year age group had significantly higher seropositivity, with 68 (95.8%) compared to other age groups (p-value=0.008). Similarly, persons belonging to the Kuruma tribal group had significantly higher seropositivity, with 46 (97.9%) compared to other tribal groups (p-value 0.002). As expected, the vaccinated group had significantly higher seropositivity (p-value 0.023), as did those who had taken two doses of the vaccine (p-value 0.027).

Variables		COVID-19 antibody		p-value
		Positive n (%)	Negative n (%)	
Age (years)	≤30	46 (78.0)	13 (22.0)	**0.008**
	31-59	131 (87.9)	18 (12.1)	
	≥60	68 (95.8)	3 (4.2)	
Gender	Male	69 (84.1)	13 (15.9)	0.227
	Female	176 (89.3)	21 (10.7)	
Community	Paniya	149 (82.8)	31 (17.2)	**0.002***
	Kuruma	46 (97.9)	1 (2.1)	
	Others	50 (96.2)	2 (3.8)	
Education	No formal education	94 (93.1)	7 (6.9)	0.275*
	Primary school	34 (81.0)	8 (19.0)	
	Middle school	61 (84.7)	11 (15.3)	
	High school	50 (87.7)	7 (12.3)	
	Post-high school diploma	6 (85.7)	1 (14.3)	
Occupation	Unemployed	14 (93.3)	1 (6.7)	0.803*
	Unskilled	129 (86.0)	21 (14.0)	
	Skilled	7 (87.5)	1 (12.5)	
	Homemaker	91 (89.2)	11 (10.8)	
	Professional	4 (100.0)	0 (0.0)	
Socio-economic status	APL	11 (84.6)	2 (15.4)	0.664*
	BPL	234 (88.0)	32 (12.0)	
Vaccine taken (at least one dose)	Yes	239 (88.8)	30 (11.2)	**0.023***
	No	6 (60.0)	4 (40.0)	
Type of vaccine	Covishield	204 (89.9)	23 (10.1)	0.217
	Covaxin	35 (83.3)	7 (16.7)	
No: of doses taken	One	93 (83.8)	18 (16.2)	**0.027**
	Two	146 (92.4)	12 (7.6)	
Any delay to second dose	Yes	13 (86.7)	2 (13.3)	0.677*
	No	226 (89.0)	28 (11.0)	
Infected with COVID-19 in the past 3 months	Yes	22 (88)	3 (12.0)	1.000 *
	No	223 (87.8)	31 (12.2)	
Hospitalised during COVID-19	Yes	20 (87.0)	3 (13.0)	0.750*
	No	225 (87.9)	31 (12.1)	
Preventive measures are taken (other than vaccination)	Yes	9 (75.0)	3 (25.0)	0.169*
	No	236 (88.4)	31 (11.6)	
History of travel	Yes	3 (100.0)	0.0 (0.0)	1.000
	No	242 (87.8)	34 (12.3%)	
History of quarantine	Yes	62 (87.3)	9 (12.7)	0.884
	No	183 (88.0)	25 (12.0)	
Have you been in primary contact with COVID-19 patients?	Yes	74 (85.1)	13 (14.9)	0.343
	No	171 (89.1)	21 (10.9)	

Any family member who became COVID-19 positive in the last 3 months	Yes	38 (84.4)	7 (15.6)	0.451
	No	207 (88.5)	27 (11.5)	
Co-morbidity	Yes	87 (85.3)	15 (14.7)	0.329
	No	158 (89.3)	19 (10.7)	
Sickle cell anaemia	Yes	5 (83.3)	1 (16.7)	0.545*
	No	240 (87.9)	33 (12.1)	
Multimorbidity	Yes	9 (75.0%)	3 (25.0%)	0.169*
	No	236 (88.4%)	31 (11.6%)	

[Table/Fig-2]: Univariate analysis of association of Seropositivity to COVID-19 antibodies with various factors. (N=279); Bold p-values are significant.

Multivariable logistic regression analysis was conducted to identify independent predictors associated with the COVID-19 antibody [Table/Fig-3]. All variables with a p-value <0.2 on chi-square analysis were considered for the multivariate model. The multivariate analysis showed that individuals aged ≥60 years (aOR-4.717, 95% CI 0.111, 20.025) were five times more likely to be seropositive, and those who were vaccinated were nine times more likely to be seropositive (aOR- 8.587, 95% CI 1.390, 53.028).

Variable		Unadjusted odds ratio	p-value	Adjusted odds ratio	p-value
Age (years)	≤30	1		1	
	31-59	2.057 (0.935, 4.525)	0.073	1.457 (0.606, 3.502)	0.400
	≥60	6.406 (1.728, 23.740)	**0.005**	4.717 (1.111, 20.025)	**0.035**
Tribal group	Paniya	1		1	
	Kuruma	9.570 (1.271,72.043)	**0.028**	6.400 (0.817, 50.106)	0.077
	Others	5.201 (1.201, 22.517)	**0.027**	4.554 (0.992, 20.897)	0.051
Vaccine taken	No	1		1	
	Yes	5.311 (1.418, 19.899)	**0.013**	8.587 (1.390, 53.028)	**0.021**
Dose taken	Two	1		1	
	One	0.425 (0.196, 0.922)	**0.030**	0.698 (0.300, 1.626)	0.405
Preventive measures taken	Yes	1		1	
	No	2.538 (0.652, 9.880)	0.179	1.502 (0.234, 9.658)	0.668
Multimorbidity	Yes	1		1	
	No	2.538 (0.652, 9.880)	0.179	2.750 (0.638, 11.84)	0.175

[Table/Fig-3]: Independent determinants of COVID-19 antibody among the participants (N=279).

DISCUSSION

The seroprevalence of COVID-19 antibodies among tribal individuals attending the primary care centre was found to be high at 87.8% (95% CI 83.98, 91.62). Individuals aged over 60 years were more likely to be seropositive, and those who were vaccinated were 8.6 times (95% CI 1.390, 53.028) more likely to be seropositive.

A study conducted by the Government of Kerala found the seroprevalence among the tribal population to be 78.2% [20]. In a study conducted in a rural district in Bangalore a year before, a very low seroprevalence of 12.4% was reported [23]. Additionally, around the same time, the national seroprevalence was 7% [13]. The higher seropositivity in the present study could possibly be due to the higher infection rate following the second wave of the pandemic, as well as the higher number of vaccinated individuals.

In this study, a significant association was found between seropositivity to COVID-19 antibodies and age, with individuals over 60 years having a higher seropositivity. This is similar to the study conducted by the Government, where seropositivity increased up to 75 years of age and then declined. In a study carried out by the Government of Kerala, seropositivity was the lowest in the over 60-year age group at 69.7%, compared to 76.2% in the 18-29 year age group. This trend has been observed in the general population as well, with individuals in the higher age group having lower seropositivity [20]. This difference may be due to the fact that it is a health centre-based study with a smaller sample size. The participant profile may be different from the general population, with better healthcare-seeking behaviour.

The Kuruma group was found to have a higher likelihood of being positive, although this was not statistically significant. Seropositivity was also found to be higher among tribal individuals with diabetes compared to the general population, although this was not statistically significant [24]. Other studies have also shown that individuals who received two doses of vaccination had a higher proportion of seropositivity. In the Government of Kerala study, seropositivity among those fully vaccinated was 85.5%, compared to 78.3% among those partially vaccinated and 67.1% among the unvaccinated. Vaccinated individuals were twice as likely to be seropositive [20].

According to a study conducted in a rural district of Bangalore, a history of atleast one self-reported symptom suggestive of COVID-19 in the last three months and higher education status were significantly associated with seropositivity [23]. However, there were no similar studies on COVID-19 seropositivity among the tribal population.

The present study revealed that a vast majority (66.7%) of participants did not have adequate knowledge about the common symptoms of COVID-19, and 66.3% of participants were not aware of mask etiquette. This is contrary to a study among Tribals in Bangladesh, where 87.0% of Chakma, 85.0% of Marma, and 81.1% of Tripura had adequate knowledge about COVID-19 [25].

Seroprevalence data are useful in understanding the current and future course of the COVID-19 pandemic. The overall seroprevalence among the tribal population was found to be high (87.8%), indicating that only a small proportion of the population remains susceptible to SARS-CoV-2 infection.

Limitation(s)

This study was conducted in a primary health centre in Kainatty, Wayanad, so it is well known that those who visit health facilities when experiencing symptoms have better health-seeking behaviour and therefore may not be generalisable to the entire tribal population.

CONCLUSION(S)

The seropositivity of COVID-19 was high at 87.8%. On multivariate analysis, older people and vaccinated individuals were more likely to be seropositive. Therefore, strengthening vaccination efforts among all age groups is necessary. The majority of the participants were not aware of the common symptoms of COVID-19. Providing health education and creating awareness among the tribal community can help prevent the spread of COVID-19. Continued serosurveillance and vaccination surveys need to be conducted to gain more insights into the antibody kinetics of this novel pathogen.

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PARTICULARS OF CONTRIBUTORS:
1. Scholar (MPH), Department of Community Medicine and Public Health, Amrita Institute of Medical Sciences, Ponekara, Kochi, Kerala, India.
2. Assistant Professor, Department of Community Medicine and Public Health, Amrita Institute of Medical Sciences, Ponekara, Kochi, Kerala, India.
3. Professor and Head, Department of Community Medicine and Public Health, Amrita Institute of Medical Sciences, Ponekara, Kochi, Kerala, India.
4. Professor, Department of Pain and Palliative Care, Amrita Institute of Medical Sciences, Ponekara, Kochi, Kerala, India.
5. Clinical Professor and Head, Department of Microbiology, Amrita Institute of Medical Sciences, Ponekara, Kochi, Kerala, India.
6. Lecturer (Biostatistics), Department of Community Medicine and Public Health, Amrita Institute of Medical Sciences, Ponekara, Kochi, Kerala, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Navami Sasidharan,
Assistant Professor, Department of Community Medicine and Public Health,
Amrita Institute of Medical Sciences, Ponekara, Kochi-682041, Kerala, India.
E-mail: iamnavami@gmail.com

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[ANNEXURE-1]

Seroprevalence to COVID-19 among adults of tribal origin attending a primary care centre in Wayanad, Kerala.

Unique ID: TP:_____Date

Community: Area: Tribal.

Socio-demographic features

1. Name	
2. Age	
3. Sex	1. Male 2. Female 3. Others
4. Religion	1. Hindu 2. Christian 3. Muslim 4. Others
5. Address	
6. Education	1. Profession or Honours
	2. Graduate
	3. Intermediate or diploma
	4. High school certificate
	5. Middle school certificate
	6. Primary school certificate
	7. Illiterate
7. Occupation	1. Professionals
	2. Homemaker
	3. Skilled
	4. Unskilled
	5. Unemployed
	6. Other
8. Income	
9. Ration card colour	

COVID 19 Vaccination details

10	Have you taken Covid vaccine	Yes
		No
11	Which vaccine	Covishield
		Covaxin
		Others (specify)
12	How many doses taken	One
		Two
13	First dose vaccination date	
14	Second dose vaccination date	
15	Source of vaccination details	Certificate
		SMS
		COWIN registry
		Hospital source
		Recall
16	Was your 2nd dose delayed?	Yes (Specify)
		No

Side-effects after vaccination

17. Did you experience any side-effects after vaccination? a. Yes b. No.

18. If yes specify the symptom?

COVID-19

19. Have you been infected with COVID-19? a. Yes b. No.

20. If yes when?.

21. Currently do you have any symptoms suggestive of COVID-19?

a. Yes b. No

22. If yes specify the symptom?

23. Have you been hospitalised during COVID-19 infection?

a. Yes b. No

24. If yes specify the duration of stay?

25. Which healthcare sector have you chosen during COVID-19?

26. Did you take any preventive measure during COVID-19?

a. Yes b. No.

27. If yes specify the measure taken?

28. Did you take any tribal remedies for covid prevention?

a. Yes b. No.

29. If yes specify the remedy?

30. Do you have any history of travel in the past 14 days?

a. Yes b. No.

31. Do you have a history of attending any social gathering in past 14 days?

a. Yes b. No.

32. Did you have a history of being quarantined?

a. Yes b. No.

33. How many members are there in your family?

34. Did any of your family member became covid positive in the past 3 months?

a. Yes b. No.

35. Have you been in contact with COVID-19 patient/ family member covid 19 positive?

a. Yes b. No.

Knowledge and awareness on COVID-19.

36. Are you aware of the common symptoms of COVID-19?

a. Yes b. No.

37. Are you aware about the mode of transmission of COVID-19?

a. Yes b. No.

38. Are you aware of the mask etiquette (right way of wearing masks, washing hands before putting on mask, disposal of masks, what kind of masks you use, double masking technique)?

a. Yes b. No.

39. Are you aware of the covid appropriate behaviour?

a. Yes b. No.

40. Are you aware about the prevention and control of COVID-19?

a. Yes b. No.

41. In case of any covid related symptoms, Will you do the tests required?

a. Yes b. No.

42. Do you have an easy access to labs for testing?

a. Yes b. No.

Past history

43. Do you have any underlying chronic health conditions?

a. Yes b. No.

44. If yes, since how many years.

45. Are you under any routine treatment?

a. Yes b. No.

49. If yes specify for what condition?