



Survey on Attitude Towards COVID-19 Vaccines and Analysis of Reasons for Vaccine Hesitancy Among Public in Tamil Nadu During The Second Wave Of COVID-19 Pandemic.

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Abstract

Vaccines are effective measures to curtail spread of infection in the community, as they break the chain of transmission and help to develop herd immunity, thereby reducing disease induced morbidity and mortality. This holds good for COVID- 19 vaccines which are developed rapidly during this pandemic. No much information are available regarding the causes for why people are hesitant to take COVID- 19 vaccine in Tamil Nadu even after suffering the ill effects of COVID- 19 infection in its second wave. This study is taken up to investigate the attitude of people of Tamil Nadu towards COVID- 19 vaccine and to analyse the reasons for vaccine hesitancy and demographic factors influencing vaccine hesitancy among the survey population. An online, cross sectional self-administered questionnaire was instrumentalized to survey adult participants from Tamil Nadu on the acceptability and attitude towards COVID-19 vaccines and to analyse the factors contributing to vaccine hesitancy. Logistic regression analysis was used to find the predictors of COVID-19 among the study population. A total of 2615 completed responses were taken up for survey. The public acceptance rate of COVID- 19 was very high (86.3%) in Tamil Nadu. Regarding the attitude, majority of the participants (more than 80%) believed that vaccines are safe and accept that that Indian made vaccines are safe and also believed that government would provide vaccines for all at free of cost. But 51.2% participants expressed their fear of side effects which would prevent them from taking

vaccines. Most trusted information regarding COVID-19 vaccines were through governmental agencies (50.8%) and through social media (42%-44%). vaccine hesitancy was noted in 36.9% of the participants. The reasons for vaccine hesitancy were multifactorial. Fear of vaccine related adverse effects (31.4%), non-availability of vaccines (20%), knowledge of multiple vaccine availability leading to confusion regarding safety and efficacy(16.9%) false belief that increasing incidence of corona infection after COVID-19 vaccination (10.8%), fear of associated medical illness (12.8%), influence of family and peer group with negative message(14%) and the belief that living in rural area would not be infected by corona virus and lack of awareness (7.15%,10.52% respectively) all contributed to vaccine hesitancy. In our study, the factors influencing vaccine hesitancy were noted in younger age, rural location, unemployment, non-graduates, unmarried and among smokers and alcoholics with statistically significant values. Systematic interventions are required by public health authorities to reduce the level of vaccine hesitancy and improve their vaccine acceptance especially among the rural population. Instead of online survey, one to one, in person survey would bring real attitude of people 60% of who live in rural India

Keywords: COVID-19 1, social media², vaccine hesitancy 3, Acceptance for covid-19 vaccine:4

Introduction

The battle against COVID-19 infection is going on for the past one and half years. The whole world is striving hard to get rid of the infection and protect the humankind from this deadly infection SARS COV2. Apart from measures like wearing masks, social distancing and hand sanitization and personal hygiene which offers individual protection, curfew, travel restrictions, cross border limitations, shutting up of industries, closure of railway stations and airports which helped to contain the spread of infection to some extent rather slowed the spread of infection¹. This also gave time for the government to prepare to treat affected people effectively and equip the hospitals to treat patients in mass number. On the other hand, effective case detection and contact tracing by rapid tests and isolation of affected individuals and treat moderate and severe cases also were taken up by all the countries to prevent explosive spread of COVID-19 infected cases². But to develop herd immunity vaccination is the only effective measure to cut the chain of transmission of COVID-19 virus in the community. What has started as pandemic has now become pandemic globally. Vaccinating all the risky population and then the eligible population with recently developed COVID-19 vaccines is the only effective strategy that is taken up by all the developed and developing countries under the guidance of WHO ³. INDIA with its large population and huge demand of vaccines has become one among the few countries which could manufacture vaccines for its own use and for export to the underdeveloped countries. The Government of India aims to vaccinate all its eligible population that is people above 18 years of age by the end of 2021⁴.

India initially approved the OXFORD- ASTRA ZENECA vaccine manufactured under license by Serum Institute of India, Pune, under the trade name Covishield and Covaxin, an indigenous vaccine prepared by Bharat Bio Tech in collaboration with ICMR and Institute of Virology⁵.

India's first vaccine roll out started on 16th January 2021 for front line health care workers, who include doctors, nurses, paramedical staffs, sanitary workers, police and paramilitary forces. By March 1st, only 14 million front line workers had been

vaccinated falling short of original goal of 30 million throughout the country, which was the first evidence of vaccine hesitancy in our country⁶. The next phase of vaccine roll out covered all the residents over the age of 60 and all the residents between the ages of 45 – 60 with one or more qualifying comorbidities and for any front line workers who did not receive vaccine during first phase. From 1st April eligibility was extended to all above 45 years of age. Third phase of vaccination drive against COVID-19 was opened up for all citizens above 18 years since 1st May. The momentum of vaccination had not picked up till India faced the on slaughter effects of COVID-19 infection during its second wave that started from April 2021 and reached its peak in May. Government and the public then only recognised the urgency and the need to mandate vaccination. This resulted in change of attitude of people towards vaccination though the component of hesitancy was persistent. Because of the wide availability of internet connections and smart phones lots of myths and misconceptions were spread among the public which were carried to nook and corners of the country⁷. This resulted in significant impact over the attitude of people towards vaccination, not only in India, but in various parts of the world including USA, UK and other developed and developing countries. Analysing the reasons for vaccine hesitancy and educate the public and alleviating their fears to get rid of their hesitancy is the need of this hour. Hence an online survey is conducted to analyse various reasons why people are hesitant to vaccine and factors influencing them are analysed in the following studies along with studying their acceptance and attitude towards vaccination⁸. In order to know the about covid-19 and To study and explore the attitude and factors influencing the attitude towards COVID-19 vaccination among people of Tamil Nadu. And to identify the reasons as to why individuals are hesitant and unwilling to take COVID-19 vaccine and the factors influencing hesitancy.

Methods

The study was approved by an institutional Ethical committee(IEC/001/GEMC&H2021: DATED 31/07/2020) of Government Erode Medical College and Hospital, Perundurai. No consent was obtained

from the participants of the survey as the data were collected anonymously. The hypothesis and the proposal was obtained much earlier than the actual vaccination stated. This is because of psychological perception of communities towards the other vaccination program for others diseases. A cross sectional, screening based study was conducted (from 10th June to 30th June, 2021) over a period of three weeks using appropriately designed questionnaire. Adults of age group more than 18 were asked to take up the questionnaire. In this study online social media platform (WhatsApp) was used to recruit participants. Participants were encouraged to pass on the questionnaire to their contacts and acquaintances. The expected main outcome of the study was to know the level of public acceptance and reasons for vaccine hesitancy towards COVID-19 vaccines amidst this pandemic.

Instrument development and measures:

The questionnaire used in this study was developed based on the literature reviews and discussions with the research team. To reduce the potential bias by self-reported data, participants were ensured on the confidentiality of their responses. The questionnaire was designed into 4 sections. A pilot survey was conducted (n=50) by one to one response analysis to improve the wordings and clarity of expressions in the scoring items. Data from pilot sample was not used in any further analysis. The final version of questionnaire required an estimated time of 3 to 5 minutes to complete. The questionnaire was developed in English and translated into Tamil (local language).

Sociodemographic characteristics and medical history:

Following socio demographic details of the participants were obtained. Data of the participants collected were age, gender, locality (urban or rural), educational status, employment status, smoking and alcoholism. In addition chronic medical conditions like diabetes, hypertension, coronary artery disease, etc were included in the medical history.

Covid-19 disease and vaccine related information:

Participants were asked to indicate if either of his/her family members were infected with COVID-19

19 virus. There were questions to indicate willingness of participants to take corona vaccine and their priority or wish to get vaccinated in government sector or in private hospital. Participants were asked to indicate sources their most trusted sources regarding COVID-19 vaccines.

Attitude towards covid-19 vaccination:

Participants of the survey were asked to express their attitude towards COVID-19 vaccination. Knowledge regarding vaccine safety, willingness to get vaccinated, efficacy of vaccine, vaccine related adverse effects, availability were also addressed with three response levels (yes, No, do not know). Variables that were investigated as potential predictors of COVID-19 vaccine acceptance include age, gender, geographic location, educational status, employment status, academic area (health care versus non health care worker), marital status, personal habits (smoking and alcoholism).

Reasons for vaccine hesitancy:

Questions about reasons for hesitancy and concerns regarding COVID-19 vaccination were framed based on the pilot survey response as ten statements. Survey participants were encouraged to tick in the given boxes and option was given to tick more than one reasons.

Results

Categorical variables were presented as numbers and percentages, while continuous variables were presented as median. Categorical values were analysed using Chi-square test.

The main outcome of the study was to analyse the reasons for vaccine hesitancy. To determine the factors that influence participants with vaccine hesitancy, both multinomial and binary logistic regressions were performed. At first, potential influencing factors for vaccine hesitancy were screened using univariable analysis, and variables with $p < 0.05$ were considered as statistically significant. The analysis was carried out using the Statistical Package for Social Sciences (SPSS) VERSION 23.

Demographics:

The study received 2700 submissions of which 2615 were complete and included in the final analysis. 60% (n= 1713) of the participants of this survey belonged to the age group between 18 – 45 years i.e. young adults. 66.3% were males and 34.7% were females among the responders. table 1, explain More than sixty percent of the participants were from urban and nearly 40% were from rural areas. In our survey 80% (n=2113) of the participants were graduates. Only 2 to 3 % (n=68) of the participants had not attended school. 74.3% of the participants were employed and one quarter of the responders were from health care sector. Among the participants 66.88 % had no significant co - morbid illness.

Acceptance for covid 19 vaccines:

In the present study nearly 50% (n=1287) of the participants were acceptable and 37% (n=1067) were already vaccinated. Only 13.7% of the study population were not acceptable to get vaccinated against COVID-19 virus. Majority of the participants (88%) wanted to have their job from government sources. As for as the knowledge regarding COVID-19 vaccines more than 93% of the participants are aware and government (50%) and social media (44.4%) contributed as their rich source of information regarding vaccines. (Table 2)

FIG.1. Most trusted sources of information regarding covid-19 vaccine: Government aids and public information with the help of social media contributed more the 50% followed by T.V/radio

ATTITUDE TOWARDS VACCINATION

Majority of the participants (nearly 80%) agreed that in general vaccines are safe as well that were made in India and were ready to get vaccinated with the same. In our study 83.4% participants also believed that government would provide vaccine to all its citizens at free of cost. Though majority of the participants agreed to get vaccinated, fear of vaccine related side effects was noted in 51.2% of the study population. Negative attitude and neutral responses were noted only in 10% of the participants in each group as shown in the Table.3

reasons for vaccine hesitancy:

Though 50% of the participants were willing to receive covid- 19 vaccine, and another 37% reported that they had received at least one dose of covid vaccine, vaccination hesitancy was noted among nearly 37% of the participants. At the time of survey of this study, vaccine related side effects like fever, pain, allergy, disability and death because of vaccination was the foremost concern among the participants. Vaccine non availability was the next frequent reason pointed out by the participants. All the other reasons contributed approximately 10% - 15% of each fig .2

Demographic factors contributing to vaccine hesitancy:

Table. 4 depicts the results of multivariate analysis (binary logistic regression) identified independent factors that predicted the level of hesitancy among the study population. The results indicated that middle age (45 – 60) and older age were less hesitant against covid vaccination when compared to younger adults. OR = 2.0/2.1, 95% CI = 1.712 – 2.073/1.511 – 3.173 , P value = < 0.001 respectively. When gender is taken in to consideration vaccine hesitancy was noted more among females than in males. Urban participants showed less hesitancy than rural participants in our study. OR = 0.694, 95% CI = 0.590 – 0.816, P = 0.007. Vaccine hesitancy was less among the graduates. Employed participants had less vaccine hesitancy compared with unemployed or retired people. OR = 2.3, 95% CI = 1.49 – 3.55, P VALUE = < 0.001. Vaccine hesitancy was present in one third of health care workers who had participated in this study and more than two third non health care workers were hesitant to vaccines. OR = 0.5, 95% CI = 0.48 – 0.74, P value = 0.003. marital status does not influence vaccine hesitancy. Vaccine hesitancy was present in both married (50%) and unmarried group (30%) . Smoking and alcoholism among the participants contributed to vaccine hesitancy which is statistically significant. OR = 1.63, 1.38, 95% CI = 1.23 – 1.63, 1.11 – 1.75, P VALUE < 0.001, 0.003 for smoking and alcoholism respectively table 4

Discussion

The study sought to examine the attitude and reasons for hesitancy for covid 19 vaccines among the general public of Tamil Nadu state amidst or at

the fall of second wave of this pandemic. When vaccines were introduced in late 2020, there were lots of information and misinformation⁹ spread among the public. The Government of India rolled out its first phase vaccination for health care workers and frontline workers on 16th January, 2021 covering an estimated 30 million health care workers. On 1st March, the country initiated the second phase aiming to cover people above 45 years with co-morbidities and cohort above 60. This was expanded on 1st April to cover everyone above 45 years. People above 45 years constitute only 22 percent of population that is around 300 million. They were the high risk and most vulnerable, accounting for 80% of the recorded COVID-19 related mortality in India. Out of a target of 600 million doses by end of July we could achieve only 123.8 million doses by middle of April 2021. However it was also in April when the country suffered the onslaught of a massive second wave with registered positive cases as high as 4,00,000 cases in May. Daily deaths recorded a steep curve crossing 4500 cases per day¹⁰. Till the peak of second wave there was lukewarm response from public because of negative attitude towards COVID-19 vaccine and vaccine hesitancy. There are approximately 96 Crore eligible people in India based on 2011 census. Tamil Nadu has more than 7 crore population and 49% of its population is being vaccinated with one dose and 14% with both doses as on first week of September 2021.

The expert group in India say that the third wave is inevitable given that the country has fully opened even as the threat of new variants loom, considering socio economic situations of various categories of working population of the country. To prevent the morbidity and mortality due to covid infection, apart from wearing masks at public places, social distancing and frequent hand sanitization which gives individual protection, mass vaccination against covid19 infection is the ideal strategy to develop herd immunity and to curtail the spread of infection in the community¹¹. Vaccine hesitancy and shortage of vaccine supply at the time of middle of second wave contributed to slowing down of vaccination in India. WHO defined vaccine hesitancy as a delay in acceptance or refusal of

vaccination despite the availability of vaccine services.

Since vaccination is made mandate in most of the work places and colleges which are to be opened up soon, young and middle aged people are made to come with the vaccination certificate which is a centralised link and Aadhar based (CoWIN)¹². Though people come forward for vaccination, the component of hesitancy remains persistently. Vaccine hesitancy was very high in Tamil Nadu (40%) Punjab (33%), Haryana (30%) and Andhra Pradesh (29%) and low in Utharakhand, Assam, Odisha and Kerala (19%)¹³. Now the public wants get vaccination after seeing the death rate in COVID-19 infection and are ready to accept the vaccine related minor adverse events. But sample survey taken by the author foresees that there would be still more hesitancy for second dose of vaccine among people for those whom vaccination certificate is not mandatory.

In the current study, middle age and older people had less vaccine hesitancy compared to younger adults which is on par with other studies¹⁴. One more reason could be related to, the nature of study design, where more number of young age people had participated in online based survey, as elderly and middle aged people are less engaged in online. When gender is taken into account more males were willing for vaccination than female which is comparable to studies done in other countries. Female were more hesitant because of fear, loss of work days and family and peer influence, myths regarding menstrual cycle disturbance, fertility issues. The vaccination ratio of male to female in India is 1000: 897. More over graduates and employed people have less hesitancy towards vaccination. The reasons could be because of awareness and mandate vaccination at work places¹⁵. Same may be the reason for less vaccine hesitancy in urban areas compared to rural areas. Interestingly vaccine hesitancy was present among one third of HCW who had participated in his study. Perhaps repeated exposure and possible subclinical infection and availability of different types of vaccines would have contributed to vaccine hesitancy among HCW. Smokers and people who are in the habit of taking alcohol are more hesitant towards vaccination.

As for as the vaccine acceptancy is concerned, more than 80 % of participants are willing and among them 37 percent were already vaccinated with at least one dose of COVID-19 vaccine. Since people of Tamil Nadu were tuned to get vaccinated from government side from childhood vaccination programme to pulse polio immunisation , they were ready to get vaccinated from government hospitals than from private sector¹⁶. Majority of the study population (80%) believed that vaccines are safe and were willing to get vaccinated. this is in contrary with US based study and Jordanian based study where nearly fifty percent of the study participants agreed that they would refuse to take the vaccine. This could be due to that the studies were done during the time of development of vaccines and before the launch of vaccine roll out. At this point of time , our participants have witnessed and experienced the ill effects of corona virus induced disease manifestation. In our study even though majority have positive attitude to take COVID-19 vaccines, still half of them had accepted that they have fear of vaccine related side effects like fever, body pain, loss functional capacity and others including death. Death of prominent cinema celebrity of Tamil Nadu who had died on the very next day of COVID-19 vaccination though due to massive myocardial infarction added fuel to the fear of people regarding vaccine related adverse events¹⁷.

An important factor to consider when exploring vaccine acceptability is vaccine convenience in terms of its availability and affordability. Majority of our participants wanted to take vaccine from government side and they all believed that government would provide vaccines to all at free of cost. But because of shortage of vaccine and overcrowding at vaccination site, many people were not willing to come forward for vaccination in June and July. Moreover people expect that health care system should knock their doors and deliver the vaccines¹⁸. Now the issue has settled to some extent that people were given tokens ward wise and vaccine is being delivered at their door steps.

The Himalayan task in front of the government is to vaccinate all the eligible population before the start of third wave which is

expected between October to December of 2021 as predicted by Indian experts. Now the rest of the developed world has started vaccinating under 12 years, we need to start vaccinating our childhood population also. Though Majority of the population are willing to get vaccinated, more than one third of the population were hesitant to take vaccine and this is more in rural and, unemployed population where vaccination is rather optional, the findings are akin to Indian studies as well as studies from Australia and Pakistan ¹⁹. One more person to person survey especially in the rural areas will disclose the attitudes of rural population where 60% of our population live. Health education , spreading the knowledge regarding the need to get vaccinated should be the prime focus and linking vaccination certificate not only with Aadhar but also with family ration card so that before getting monthly ration, all the adults members are getting vaccinated even in rural areas. In conclusion, we identified that people in Tamil nadu, one of the most populous state of India, where population density is high as well the educational status, employment status of people are high and also suffered severely by the COVID-19 infection during its second wave which occurred during April to June 2021, have very high acceptancy rate for COVID- 19 vaccines and positive attitude towards covid vaccines. But their expectations remained to the level that vaccination to be available to all through the government .There was component of hesitancy in nearly 40% of the participants and the reasons are multifactorial. Though fear of vaccine related adverse events contributed to nearly 30% and non-availability vaccines and availability of multiple vaccines that led to confusion in choosing he type of vaccine contributing to 20% and 17% respectively, other factors like fear of comorbid illnesses, misconceptions like increase in incidence of COVID-19 infection after the start of vaccine roll out, living in rural areas and negative influence by family and friends contribute to nearly 10% of each. What the government could do so far was to make the vaccines available to all by distributing vaccines equally to all villages and towns, distributing tokens to eligible population there by avoiding crowding at vaccine site and vaccine wastage. Now the responsibility falls on the government and health sector to alleviate the fears, mis-concepts and

educate every individual by addressing their fears through village health nurses who are the first contact of our health system and village administrative officers to check with the vaccination status of all the family members and issuing certificates by linking not only Aadhar card but also linking family ration card to get their monthly benefits. This would enable all the rural eligible population to get vaccinated without hesitancy.

Acknowledgments

none

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Table.1. demographic variables :

Variables	N	Percentage (%)
Age		
18 - 45 years	1731	66.20
45 - 60 years	725	27.72
> 60 years	159	6.08
Gender		
Male	1708	65.32
Female	907	34.68
Geographic Location		
Urban	1585	60.61
Rural	1030	39.39
Educational Status		
Graduate	2112	80.76
School educate	435	16.63
Uneducated	68	2.60
Employment Status		
Employed	1944	74.34
Unemployed	534	20.42
Retired	137	5.24
Health care work		
Health care worker	519	19.85
Non-health care worker	1611	61.61
Marital Status		
Married	2058	78.70
Unmarried	557	21.30
Smoking		
Yes	209	7.99
No	2406	92.01
Alcoholism		
Yes	393	15.03
No	2222	84.97
Vaccines are safe		
Yes	2060	78.78
No	191	7.30
Do not know	364	13.92

Table.2. Acceptance for covid-19 vaccine :

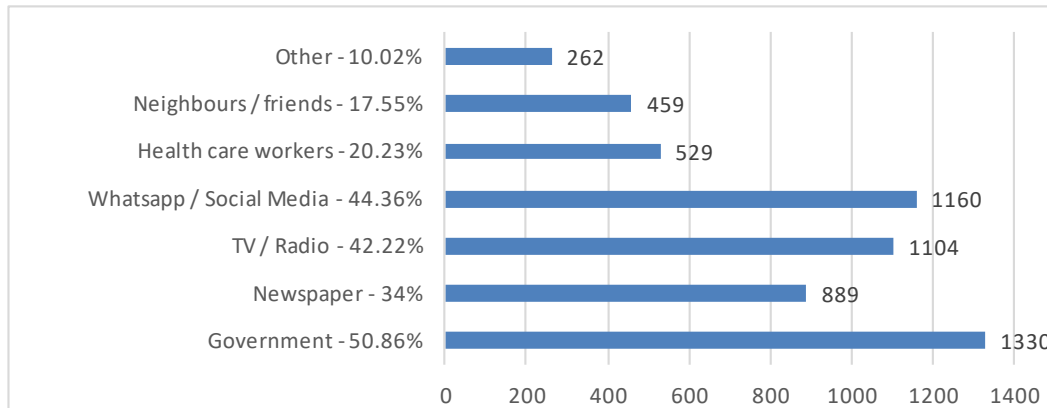
ACCEPTANCE FOR COVID-19 VACCINE	N	Percentage (%)
Are you willing to get vaccinated with corona vaccine?		
Yes	1287	49.22
No	357	13.65
Already vaccinated	971	37.13
If yes, from where do you wish to get vaccinated?		
Government Hospital	1731	66.20
Private Hospital	236	9.02
Have you or your family members suffered from Covid - 19 infection?		
Yes	744	28.45
No	1871	71.55
Knowledge regarding Corona Vaccination		
Yes	2451	93.73
No	164	6.27

Table.3

N=2615				
Attitudes toward COVID-19 vaccines				
S.No	Description	Yes	No	Do not know
1	Attitude towards Vaccination : [In general vaccines are safe]	2130(81.5)	184(7)	301(11.5)
2	Attitude towards Vaccination : [I am ready to get vaccinated]	2205(84.3)	322(12.3)	88(3.4)
3	Attitude towards Vaccination : [Vaccination will prevent the spread of disease in the community]	2126(81.3)	265(10.1)	224(8.6)
4	Attitude towards Vaccination : [Vaccines made in India are safe and effective]	2060(78.8)	191(7.3)	364(13.9)
5	Attitude towards Vaccination : [Fear of Side effects will prevent me from taking vaccines]	1340(51.2)	1136(43.4)	139(5.3)
6	Attitude towards Vaccination : [Government will make the vaccines available for all citizens for free]	2181(83.4)	199(7.6)	235(9)

Table.4. Demographic predictors for COVID-19 vaccine hesitancy

Factors	Vaccination hesitancy		OR	95% CI		p-value
	Yes	No		H	L	
Age						
18-45	734	997	Ref			
45-60	190	535	2.07301	2.50933	1.71256	<0.001
>60	40	119	2.19022	3.17304	1.51182	<0.001
Gender						
Male	598	1110	Ref			
Female	366	541	0.79633	0.93992	0.67468	0.338
Geographic Location						
Urban	531	1054	Ref			
Rural	433	597	0.69461	0.81662	0.59083	0.007
Educational Status						
Graduate	746	1366	Ref			
School educate	185	250	0.738	0.91044	0.59822	0.269
Uneducated	33	35	0.57922	0.93969	0.35702	0.638
Employment Status						
Employed	703	1241	Ref			
Unemployed	234	300	0.72625	0.88208	0.59796	0.133
Retired	27	110	2.30788	3.55137	1.49979	<0.001
Health care work						
Health care worker	148	371	Ref			
Non-health care worker	644	967	0.599	0.74272	0.48309	0.003
Marital Status						
Married	733	1325	Ref			
Unmarried	231	326	0.78072	0.94521	0.64485	0.423
Smoking						
Yes	100	109	Ref			
No	864	1542	1.63736	2.1749	1.23268	<0.001
Alcoholism						
Yes	171	222	Ref			
No	793	1429	1.38804	1.72527	1.11673	0.003
Vaccines are safe						
Yes	580	1480	Ref			
No	148	43	0.11386	0.16204	0.08001	<0.001
Do not know	236	128	0.21255	0.26902	0.16794	<0.001

FIG.1. Most trusted sources of information regarding covid-19 vaccine**FIG.2. Reasons for covid-19 vaccine hesitancy**