Original Research

Perception and Attitude of Indian Population towards COVID-19 Vaccines

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ABSTRACT:
Aim: Study of indian Population for Perception and Attitude towards COVID-19 Vaccines. **Methods:** For the current study, an e-survey was conducted by preparing a questionnaire on Google survey tool (Google Forms)to gather primary data. Participants were clearly informed about the purpose of the study, assured about the confidentiality of the information provided by them. Filling up the form was totally voluntary, that itself meant consent from the respondents.The questionnaire prepared for the study was divided into four broad sections. **Results:** Out of a total of 1000 respondents, slightly more than half of the respondents were female (55%).About half of the respondents (49%) were below 20 years of age. 510 respondents were above 20 years of age. Majority of our respondents were graduates (65%), followed by postgraduates (35%).The largest income group (36%) of our study was people with 5 to 15 lacs per annum as their household income.Majority of the participants were urban dwellers (80%).More than half of the participants belonged to small family size (less than or equal to 3 members, 53%) while 47% had families with ≥4 members. Little less than half of the respondents had children (<18 years of age) at home (48%). For ease of understanding, all three vaccines were taken together as one. It was observed that out of the total population, 90%were willing to take the Covid-19 vaccine while 10% were unwilling or had not yet decided at the time of study. Gender, age, education level, family size, having or not having children at home had no statistically significant impact on the respondents" willingness to take the Covid-19 vaccine. However, urban population was statistically more willing (81.67%) to take the vaccine while rural population was more likely to be aversive (35%) to take the vaccine. Also, respondents with annual household income >5 lacs (61.11%) were statistically more willing to take the vaccine, while those with lower income were more unlikely (60%) to take the vaccine. At the same time, respondents who had a history of chronic physical/mental health condition were statistically less likely to take the vaccine (12%) while those with no such health condition were more likely to take the vaccine (94.44%). **Conclusion:** We concluded that the indian population in the 18-45 age bracket. Results of the present study will help Indian government devise better vaccine-promoting strategies among the hesitant populations of India, by addressing the key-barriers and influencers, utilizing the sources of information prevalent among Indian population.
Keywords: COVID-19, vaccine, willingness, awareness, hesitancy

INTRODUCTION
Coronavirus disease (COVID-19) is a deadly disease which continues to affect many countries in the world.

This is caused by the new coronavirus strain SARS-CoV-2 which has become a serious public health concern worldwide.[1] The World Health Organization

(WHO) declared the COVID-19 outbreak as a pandemic on 11 March 2020.[2] At the time of writing (6 February 2021), this pandemic has affected 223 countries, with over 104.37 million confirmed cases and 22.71 million deaths recorded globally.[3] The incidence is higher in the Americas (46313540 cases and 1072244 deaths) and Europe (35003091 cases and 767235 deaths) than in South East Asia (12982540 cases and 199668 deaths), Africa (2616892 cases and 64473 deaths) and the Western Pacific (1466248 cases and 25526 deaths).3 The first COVID-19 case in Bangladesh was reported on 8 March 2020.[4,5] India began the COVID 19 vaccination campaign on 16 January 2021.[6,7] As of 04 September 2019, India has vaccinated 67.6 crore people amounting to about 11% of the population fully vaccinated.[7] However, this rate of vaccination is not sufficient to halt the pandemic. There are also substantial inequities in gender, class, and rural-urban divide in coverage of vaccines in India.[8,9] Currently the main vaccines available in India are Oxford-Astra Zeneca vaccine locally referred to as Covishield, Bharat Biotech-ICMR indigenous vaccine named Covaxin and the Russian Sputnik V vaccine which is imported.[6] In addition several other vaccines have also been given emergency use authorization. While availability and distribution of the vaccines remains a challenge, even in places where vaccines are made available there is vaccine hesitancy.[10] Vaccine hesitancy is the reluctance of people to accept a vaccine that has been proven safe and effective and made available to them for protection against an infectious disease.[11] A 5 C model has been proposed to understand vaccine hesitancy. This model explains that vaccine hesitancy is driven by five main determinants namely: confidence, complacency, convenience, risk calculation and collective responsibility.[12] Vaccine denial and hesitancy has been in existence in populations right from the time of Jenner's smallpox vaccination. Antivaccination groups have always co-existed along with advances in vaccination technology.[13] More recently, the Andrew Wakefield scandal in which the research showed an association between the MMR vaccine and autism created a huge anti-vaccination sentiment and led to reduced vaccine uptake in the United States.[14] In India, vaccine hesitancy and reluctance to accept vaccines exist in significant numbers even for routine immunization. Therefore, vaccine hesitancy associated with COVID 19 vaccines is not new or unexpected. The overall vaccine hesitancy to routine childhood vaccines in Tamil Nadu showed a rising trend even before the COVID 19 pandemic.[15] There were several instances of hesitancy related to the Measles-Rubella vaccine when it was introduced in campaign mode in the state in 2016.[16] When the COVID 19 vaccination campaign was launched in India on 16 January 2021, during the early phase there was significant hesitancy among health care providers who were the target population to be covered then.[17]

MATERIAL AND METHODS

The study was conducted from June 2020 to May 2021, after taking the approval of the protocol review committee and institutional ethics committee. Indian Government has started vaccination roll-out for 18-45 years of age group from 1st May, 2021. For the current study, an e-survey was conducted by preparing a questionnaire on Google survey tool (Google Forms)to gather primary data. A shareable link was generated and floated on WhatsApp and various other social media groups, widely used by most age groups. Direct emails were also sent to the researchers" contacts and participants were requested to pass on the questionnaire further to their contacts or acquaintances. The data was collected online, as a precautionary mean of maintaining social distancing, during the ongoing second wave of pandemic in India. Convenience sampling method was used to collect the data as the respondents did not belong to any specific framework. The researchers tried to approach anyone with in the age bracket of 18 -45 years, irrespective of gender, education level, socio-economic background, profession and family size. Participants were clearly informed about the purpose of the study, assured about the confidentiality of the information provided by them. Filling up the form was totally voluntary, that itself meant consent from the respondents.

The questionnaire prepared for the study was divided into four broad sections. The first section sought information related to the socio-demographics of the respondents. The second section focussed on their awareness level of various vaccines available in India. It also included a question asking their source of information regarding Covid- 19 vaccines *(How you came to know about Covid-19 vaccines first?)* with some possible options: Mass media (Radio, TV), Social media (Facebook, Twitter, etc.), Internet, Newspaper/News App, family members and relatives, Friends and neighbours. Third section focussed on the respondents" willingness/acceptance for covid-19 vaccine with direct questions: *Will you get vaccinated with Covid related vaccines when your turn comes?* and *Have you got registered for the vaccination drive? etc.* In the fourth section, attitude-based questions were asked to assess the level of hesitancy or willingness of respondents to get vaccinated. Responses in the fourth section were rated on a 5 - point Likert scale (Likert 1932) from „stronglydisagree" to 5 „stronglyagree" .

STATISTICAL ANALYSIS

Statistical analysis was carried out using Microsoft Excel 2019 and SPSS version 21(Chicago, IL, USA). Microsoft Excel was used for data cleaning, editing, sorting and coding. Final excel file was imported to SPSS software for further analysis. Descriptive analysis (i.e. frequency, percentage, mean, standard deviation) was performed, followed by t-test to determine significant relations of the mean awareness, perception and attitude scores with socio-demographic

information. All tests were two-tailed and p-values less than 0.05 were accepted as statistically significant.

RESULTS

The questionnaire generated a total of 1000 responses from India that comprised postgraduate and graduate students, university teachers and other professionals plus household workers in the age bracket 18-45 years. The respondents were categorized into groups based on certain factors viz. Younger age group (below 20 years) and older age group (above 20years of age), Male and Female (on the basis of gender), Small family size (less than or equal to 3 members) and large family size (greater than or equal to 4 members), Having children at home and not having children at home, Urban and rural (on the basis of place of residence), Postgraduate andGraduate/below (level of education), Suffering from chronic/long term physical/mental health condition or not, Previous infection/hospitalization with Covid-19 or not. These groups helped understanding the association of various demographic factors with the respondents" knowledge, awareness and attitude toward Covid-19 vaccines.

Out of a total of 1000 respondents, slightly more than half of the respondents were female (55%).About half of the respondents (49%) were below 20 years of age. 510 respondents were above 20 years of age. Majority of our respondents were graduates (65%), followed by postgraduates (35%).The largest income group (36%) of our study was people with 5 to 15 lacs per annum as their household income.Majority of the participants were urban dwellers (80%).More than half of the participants belonged to small family size (less than or equal to 3 members, 53%) while 47% had families with ≥4 members. Little less than half of the respondents had children (<18 years of age) at home (48%). For ease of understanding, all three vaccines were taken together as one.

Table 1. Socio-demographic characteristics of the respondents

Socio-demographic factor		N	%
Age	20 years and below	490	49
	Above 20 years	510	51
Gender	Male	450	45
	Female	550	55
Education level	Postgraduate	350	35
	Graduate and below	650	65
Annual household income	5 lacs and below	410	41
	Above 5 lacs	590	59
Residence	Rural	200	20
	Urban	800	80
Family size	upto 3 members	530	53
	4 and above	470	47
Children	Yes	480	48
	No	520	52

It was observed that out of the total population, 90%were willing to take the Covid-19 vaccine while 10% were unwilling or had not yet decided at the time of study. Gender, age, education level, family size, having or not having children at home had no statistically significant impact on the respondents" willingness to take the Covid-19 vaccine. However, urban population was statistically more willing (81.67%) to take the vaccine while rural population was more likely to be aversive (35%) to take the vaccine. Also, respondents with annual household income >5 lacs (61.11%) were statistically more willing to take the vaccine, while those with lower income were more unlikely (60%) to take the vaccine. At the same time, respondents who had a history of chronic physical/mental health condition were statistically less likely to take the vaccine (12%) while those with no such health condition were more likely to take the vaccine (94.44%).However, previous infection with Covid-19 had no impact on their willingness toward the vaccine.

Table 2.Comparison of sociodemographic variables of the respondents with willingness to take Covid-19 vaccine

Willingness to take vaccine					
		Yes==900		No=100	
		N	%	N	%
Age Groups	20 years and below	430	47.78%	60	60%
	Above 20 years	470	52.22%	40	40%
GENDER	Male	402	44.67%	48	48%
	Female	498	55.33%	52	52%
With or without Child	No Children	469	63.22%	51	51%

	One or more children	431	36.78%	49	49%
Adults in the house	3 or less	500	55.56%	30	30%
	More than 3	400	44.45%	70	70%
Level of education	Post Graduate	322	35.78%	28	28%
	Graduate and below	578	64.22%	72	72%
Annual Household Income	5 lakhs or less	350	38.89%	60	60%*
	More than 5 Lakhs	550	61.11%*	40	40%
Residence	Rural	165	18.33%	35	35%*
	Urban	735	81.67%*	65	65%
Do you have any chronic/long term physical/mental health condition?	Yes	50	5.56%	12	12%*
	No	850	94.44%*	88	88%
Family size of the household	Less than or equal to 3 members	500	55.56%	48	48%
	More than 3 members	400	44.44%	52	52%
Have you ever tested positive for the COVID-19 infection?	Yes	220	24.45%	23	23%
	No	680	75.55%	77	77%
Have you ever been hospitalized for the COVID-19 Infection?	Yes	2	2.22%	4	4%
	No	898	97.78%	96	96%

Regarding awareness of the Covid-19 vaccine, out of total 100 respondents, 98% were aware of Covid-19 vaccines which is significantly higher than the unaware ones (2%). Both male and female belonging to all age groups and having all education levels were equally aware of the Covid-19 vaccines. Awareness levels were significantly higher (at $p<0.05\%$) among higher income group people (98%) and urban population (98%) and people with no children at home (98%). While unawareness was significantly more prevalent (at $p<0.05\%$) among lower income group (97%) and ruralpopulation(94%) and those with children at home (96%).

Table 3. Comparison of sociodemographic variables of the respondents with awareness of Covid-19 vaccine

	Awareness of Vaccine		
Socio-demographic factor		Aware of vaccine	Unaware of vaccine
Age groups	20 years and below	96%	4%
	Above 20 years	98%	2%
Gender	Male	97%	3%
	Female	97%	3%
Children	No	98%*	2%
	Yes	96%	4%*
Family size	Less than 3		
	4 or more		
Level of education	Post Graduate	98%	2%
	Graduate and below	98%	2%
Annual Household Income	5 lakhs or less	97%	3%*
	More than 5 Lakhs	98%*	2%
Residence	Rural	94%	6%*
	Urban	98%*	2%
If any chronic/long term physical/mental health condition	Yes	93%	7%
	No	97%	3%
If previous COVID-19 infection	Yes	99%	1%
	No	97%	3%
If ever been hospitalized for the COVID-19 Infection	Yes	100%	0%
	No	97%	3%

Among the respondents who were willing to take the vaccine, the major drawing factor was – that the vaccine is good for protection of self, family and the entire community as it will help developing herd immunity to combat the spread of Covid-19 (mean 4.76±0.95) and making them immune to the virus (mean 4.22±1.38). Though respondentsalso wished to get vaccinated because it was compulsory in their workplace (mean 2.98±1.57) or because government will soon make Covid-19 vaccination compulsory(mean 2.91±1.48).

Table 4. Reasons for the willingness to get vaccinated

Factor Mean Std. Deviation		
It is good for protection of self / family / the entire community through herd immunity	4.76	.95
I have heard that Government will soon make the vaccine mandatory	2.91	1.48
Getting vaccinated is compulsory in my office/workplace	2.98	1.57
The vaccine will make me immune to Covid	4.22	1.38

On the other hand, among the hesitant group, the respondents" concern about the vaccine side- effects (mean 4.23±0.69) was the most common reason for their hesitancy to take the vaccine, followed by their belief that Covid- 19 vaccines would be ineffective against the virus and its mutants (mean 3.02±0.78). Also, respondents were of the view that in case the scale of the pandemic gets very low, they would not need to take the vaccine shot (mean 2.88±1.21)

Table 5. Reasons for hesitancy to get vaccinated

Factor Mean Std. Deviation		
Covid vaccines are ineffective against Covid and its mutants	3.02	0.78
I am concerned about the vaccine side effects (fever, headache, nausea, allergy)	4.23	0.69
The vaccine is only a way of government's commercial profiteering, so i will not take it	2.57	1.22
I don't want to go out, so if someone comes to my place to vaccinate me only then i will get the vaccine	2.45	1.23
I think I am immune/not at risk to Covid-19	2.35	1.36
I am religious and God will protect me	2.26	1.37
When everyone will get vaccinated, I don't need vaccine anyways	2.03	1.12
I am afraid of needles	2.22	1.33
It depends on the scale of the pandemic at the time of the vaccine. If very low, I may not need it	2.88	1.21

Among people who had already registered for the countrywide vaccination drive being started by the Government of India (GoI), males (58%), older age group (58%), people with no children at home (56%) and people with annual household income >5 lacs (61%) and urban population (53%) were significantly higher, till the time of this study. Education level and previous infection with Covid-19 had no significant impact on their registration for vaccination drive.

DISCUSSION

As the covid-19 pandemic is spreading fast globally, newer and effective vaccines are being developed. While the distribution of vaccines is underway, it becomes important to examine community acceptance of Covid-19 vaccinations, because that is an effective measure to combat the deadly coronavirus from further spreading, beside social distancing and wearing masks.[18] One of the pioneer countries for developing Covid-19 vaccine,India rolled-out first vaccine on 16th January 2021 and Manish Kumar, a sanitation worker (34-year-old) at All India Institute of Medical Sciences (AIIMS), Delhi was the first recipient of Covid-19 vaccine *Covaxin* developed by Bharat Biotech, India. Other vaccines being manufactured in India is the AstraZeneca vaccine, *Covishield* while the Russian vaccine, *Sputnik V* is also underway. India has now started vaccine roll-out for population between 18-45 years of age. But still there is great controversy regarding vaccination among general public in India.As per our knowledge, this is the first studyof its kind in Indian context.

In our study, only 2% people (between the age 18-45 years) were reluctant to take the vaccine. This percentage is lower than the one reported in most other studies viz. 2.2% in India.[19] 20% in Bangladesh (AkifulHaqueet al [20]), 14% in UK (Paul et al[21]), 20.2% in Canada (Ogilvie et al [22]).A global study found that vaccine acceptance rates varied from nearly 88.6% in China to less than 55% in Russia(Lazarus et al[23]). Another global survey done by ORB International and the Vaccine Confidence Project (London School of Hygiene & Tropical Medicine) in 32 countries revealed that vaccine acceptance was highest in Vietnam (98%), India (91%), and lowest in Serbia (38%) (Wouters et al[24]). A similar study done in China (Lin et al) and Bangladesh (AkifulHaqueet al[20]) reported that over half of their participants were willing to take the vaccination. Although a low proportion of people are hesitant to take the vaccine but this is also worrisome, because these are the ones who become potential leads to further spread of the disease.[18,24]

The findings reflect a large number of socio-demographic factors influencing the awareness, attitude and perception toward Covid-19 vaccinations. Socio-economic factors were associated with attitude towards Covid-19 vaccine, with urban population and those with annual household income >5 lacs more willing to take the vaccine while rural population and those with lower income i.e. lower socio-economic group was more unlikely to take the vaccine. This is consistent with the prior work done in India (Kumari et al[25]2021), UK (Paul et al[21]),Japan (Machida et al[26]), China (Lin et al[27]), Bangladesh (AkifulHaqueet al). The fact that individuals of lower socio- economic status were hesitant to take the vaccine might further escalate the existing inequalities in exposure to and experience of Covid-19 in India. Also, people with no history of chronic disease were more willing to take the vaccine. These results are consistent with the studies done in Oman (Al-Marshoudi et al[28]). Gender, age, education level, family size, having children at home were unrelated to the respondents" willingness to take the Covid-19 vaccine, in our study. Though there are contrasting reports of gender-biased acceptance toward Covid-19 vaccines viz. more positive attitude of females in Bangladesh (AkifulHaqueet al[28]), while more ofmales inOman (Al-Marshoudi et al [28]), Jordan (El-Elimat et al29 2021) and China (Wang et al [30]). Highly educated people were more likely to receive the vaccine in Bangladesh (AkifulHaqueet al[20]) and in Canada (Ogilvie et al [22]) while less willingness of postgraduates to receive the vaccine was reported in India (Bhartiya et al [19]) and in Oman (Al-Marshoudi et al[28]).

Our results suggest that the largest attitudinal barrier to receiving a Covid-19 vaccine among this age bracketis concern about the safety aspects and effectiveness of vaccines toward mutant strains, at large. People also believed that if the level of pandemic goes too low, they might not need to get vaccinated.On the other hand, the major drawing factor for vaccine acceptance was usefulness of vaccine in developing herd immunity to combat the spread of Covid-19 and developing immunity against the virus, in line with studies done in India (Kumari et al [25]), Bangladesh (AkifulHaqueet al[28]). Concern about vaccine safety and side effects was also a major retarding factor in studies done by Paul et al[21] in UK, Ogilvie et al[22] in Canada, El-Elimat et al[29] in Jordan, UAE, Al-Marshoudi et al[29] in Oman and Wang et al[30] in a repeat cross-sectional survey in China. This indicates that increased assurance regarding vaccine side effects and vaccine safety would make people more likely to take the vaccine, and increase the chances of vaccine acceptance, as supported by a study conducted in 19 countries by Lazarus et al [23] where 71.5% of responders reported that they would take a vaccine that is proven safe and effective.

Willingness to get vaccinated can also be gauged from the respondents" tendency to get registered at Government of India (GoI) websites dedicated to Covid-19 vaccination drives. Registration was done by more male respondents, older age group, those with no children at home, ones with higher income group and urban population. Education level and previous infection with Covid-19 had no significant impact on their registration for vaccination drive.So, there was partial effect of socio-economic status here too.No previous work on this aspect could be found in literature survey.

Findings from the present study showed a high impact of socio-economic status on the respondents" level of awareness as well. Higher income group and urban population were more aware about Covid-19 vaccines than the lower income group and rural population. Though gender, age and education levels had no impact on awareness of Covid-19 vaccines. This is in agreement with previous studies carried out in Bangladesh (AkifulHaqueet al[20]) who reported that people with higher levels of education, nuclear families, from upper socio-economic strata and living in urban areas were more aware of the Covid-19 vaccines while gender had nothing to do with awareness. Kumari et al[25]) found an overall low awareness regrading Covid-19 vaccines among their sample population in India. This might be because of the fact that more educated people seek more information about the developments going on in the field of science and are more calculative about the pros and cons of the same. At the same time, they are more concerned about their health and well-being.

In order to implement a successful vaccination-to-all program in India, it is imperative for the government and policy makers to understand Indian population" s awareness and perception toward the vaccines. Understanding the most common and most trusted source of information will help the policy makers find directions of disseminating future Covid-19 vaccination information and campaigning in India. Our research findings reveal that the main source of knowledge about Covid-19 vaccines was mass media, which is also supported by previous studies viz. Kumari et al[25] found that news from healthcare workers, government agencies, family and friends, news from TV/radioand social media platforms were most trusted sources of information among Indian sample they studied;Healthcare providers, pharmaceutical companies" reports followed by government agencies and social media in Jordan (El-Elimat et al[29]) and Healthcare providers, social media followed by television in Oman (Al- Marshoudi et al[28]) were considered the most trusted source of information.

Though the present studies might not give a comprehensive view of the knowledge, perception and attitude of Indian population between 18 to 45 years of age towards Covid-19 vaccine, since the data is not a national representative. Also, vaccine perception keeps on changing with time and experience fromone" s surroundings.

Our findings do suggest a need for vaccine-promoting initiatives by Government of India among people of low socio-economic and rural background, hesitant for Covid-19 vaccine.Promoting public health campaigns, incentivising the vaccine and including those who are already vaccinated may help in motivating reluctant individuals for vaccination (Xiao et al[18]).Interventional education programs withsome religious/community backing might help in overcoming this hesitancy.Making the vaccine free or available at subsidized rates by the GoI could help in enhancing vaccine acceptance among the people belonging to lower SES and rural background. Also, "robust pharmacovigilance systems alongside compensation schemes for severe adverse events" might help build confidence in vaccine safety (Wouters et al [19]).

CONCLUSION

We concluded that the indian population in the 18-45 age bracket. Results of the present study will help Indian government devise better vaccine-promoting strategies among the hesitant populations of India, by addressing the key-barriers and influencers, utilizing the sources of information prevalent among Indian population.

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