Awareness and Attitudes toward COVID-19 Vaccinations: A Cross-Sectional Study in Dharwad, Karnataka, India

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Introduction

A peculiar new disease, COVID-19 affecting the lungs, causing cough, and difficulty in breathing, has affected people in most countries. The disease, first noticed in the Wuhan province, moved to the entire world in a short period. There were a large number of people with mild symptoms, some with severe forms of the disease, and some in very severe stage, resulting in their death. In total, 425 million people suffered, 351 million fully recovered, and 6 million died worldwide. This sudden disease crisis has united every one across the globe to control and minimize the severity of the disease. Toward this goal, scientists, doctors, and researchers are engaged with studies on the disease, disease-causing viruses, treatment regimen, and some other developed vaccines to prevent the illness. In a routine standard procedure, inventing a new drug or vaccine takes a few years from thought to clinical trials. However, in the present day, technology has advanced so much that it has come up with answers in a short time. That is how we have a few vaccines against COVID-19 disease ready for use in an emergency. In all these ventures, strict procedures, protocols, ethical considerations, and regulatory requirements have been adhered to and only upon such satisfaction they have been released for use in the population. The governments have taken a decision to use these vaccines on their people. They have made widely dispersed information about vaccines available to people through popular media. The questions can be numerous: "has this information reached the grassroots level, have people understood the benefits and risks, is the information adequate to make informed consent to take the vaccines, who will receive the vaccines first, given the limited supply." There is a need for studies on all these issues from different parts of the geography, different culture, different ethnicity cutting across borders. The situation is peculiar, vaccine put up in short period, launched nationwide, what in the event of adverse side effects, what if sizeable population refuse vaccination?

In any given scenario, there are persons with advanced age, disability, chronic disease, dependency internet surfers, rumor mongers, atheists who may flatly refuse to take the vaccine. If such persons are influential, they may induce others not to take the shots. In our observation of a group of health workers, few 1% refused fully, 5% pretended with lame excuse to take vaccine, and 12% were undecided. The Internet is a great leveler, and social media is rich with many experiences. In this context, one such effort in this direction is to identify the level of awareness and extent of attitude toward COVID-19 vaccinations in Northern Karnataka.

There are studies from Bangladesh, the UAE, the Middle East region, Africa, and Europe suggesting adequate knowledge and a hostile attitude toward COVID-19 vaccines.[1–8]

We proposed and obtained permission for this study from our Institutional Research committee [IRC23/April2021]. We conducted a cross-sectional study from July to September,

2021, when vaccination was in progress, among individuals aged between 18 and 60 years. Our sample included 500 individuals selected by random sampling from urban (250 individuals) and rural areas (250 individuals). We obtained written consent from participants. A pretested, structured questionnaire was used. We approached the individual; the data was collected by a face-to-face interview. All the participants completed the study survey except four, and the response rate was 99.00%. Earlier, we conducted a pilot study to estimate the sample size, with a convenient sample of 50 respondents, and estimated the percentage of knowledge toward COVID-19 vaccination to be 79.80%. Based on this work, we calculated a minimum sample size of 429 with a 99% confidential interval and a 5% permissible error. This figure was rounded off to 500 to minimize errors.

Tools of Measurement

We used a pretested, validated, structured questionnaire that included informed consent, sociodemographic information, knowledge, and attitude toward COVID-19 vaccination.

Sociodemographic Profile

We asked about age (in years), gender (male/female), marital status (single/married), educational level (illiterate, primary, secondary, higher secondary, degree, and postgraduate), family type (joint/nuclear), family income (in Indian rupees later classified as low, middle, and upper socioeconomic), and current residence (urban/rural).

Attitudes and Knowledge

From previous literature, a set of validated questions (six questions for knowledge and the other six questions for attitude) were used to gauge the level of knowledge and attitude of the participants. For each question in the knowledge section, there are three possible answers, that is, "Yes," "No," and "Don't know." These responses were coded as 1 for "Yes," while the "No" and "Don't know" responses were coded as 0. The total score was obtained by summing up the raw scores, with the higher score indicating the greater level of knowledge toward COVID-19 vaccinations. The reliability coefficient of the knowledge scale was 0.8471.

There were six items in the attitude section, and the response of each item was shown on a three-point Likert scale (i.e., $0 =$ Disagree, $1 =$ Undecided, and $2 =$ Agree). The total score was arrived at by summing the raw scores of the six items ranging from 0 to 12, with the higher score indicating more encouraging attitudes toward the COVID-19 vaccine. The reliability coefficient of the attitude scale was 0.8014.

Statistical Analysis

For data analysis, we used Microsoft Excel 2010 and SPSS version 20.0 (IBM, Bangalore, India) for data analysis. The data coding, sorting, editing, and cleaning were done using Microsoft Excel. The clean data in the Excel file was put into SPSS Software. Then descriptive statistics (i.e., frequencies, percentages, means, and standard deviations) and univariate analysis (i.e., chi-squared tests, Fisher's exact tests) were performed. In the end, to estimate the joint impact of sociodemographic profile on knowledge and attitude scores, multiple linear regressions were performed. The p-value was set at less than 0.05% for statistical significance.

Ethical Consideration

We have complied with all the other principles and protocols for human investigations (i.e., the Helsinki Declaration) and also the ethical guidelines of the institutional review board. The participants in the study were fully informed about the purpose, procedures, risks, and benefits of the study. They were also informed of the confidentiality and anonymity of the information so collected. The participants consented and participated willingly in the study.

Demographic Profile of Participants

A total of 500 responses were included in the analysis. Of them, 50% each were from rural and urban locations; the mean age was 38.70 10.24 years, ranging from 18 to 60 years. The maximum participants were male (60.00%), 58.40% were over 36 years of age, married (78.40%), and had secondary, university, or higher levels of education (63.80%) (►Table 1). The majority were from nuclear families (68.40%), and were in the upper socioeconomic status group (24.40%). During the study, ~95.00% of participants reported receiving at least one dose of COVID-19 vaccine.

Knowledge about the COVID-19 Vaccine

The overall mean percentage of knowledge about the COVID-19 vaccine is 63.40 18.92. Further, 58.60% of respondents know about the COVID-19 vaccine, 67.20% of respondents know about the effectiveness of the COVID-19 vaccine, 63.80% of respondents felt that it is dangerous to use overdose vaccines, and 78.80% of respondents felt the vaccination increases allergic reactions. But, only 52.60% of respondents felt the vaccination increased autoimmune diseases. The male respondents had significantly higher knowledge about the COVID-19 vaccine as compared with females ($p < 0.05$) (►Table 2). However, the urban respondents have significant and higher knowledge of the COVID-19 vaccine, knowledge about the effectiveness of the COVID-19 vaccine, vaccines that cause dangerous overdose reactions, vaccination increases allergic reactions, and vaccination decreases the tension of autoimmune diseases ($p < 0.05$) as compared with rural respondents (►Table 3). The multiple linear regression, urban and married, retained having higher levels of education and having nuclear families as factors significantly associated with knowledge (►Table 4). The model is significant with $R = 0.5828$ and $F = 36.164$, $p < 0.05$ and SD 15:480.

Table 1 Sociodemographic profile of participants ($n = 500$)

Variables	No. of respondents	Percentage of respondents
Area of residence		
Rural	250	50.00
Urban	250	50.00
Age groups		
18–25	72	14.40
26–35	136	27.20
36–45	152	30.40
≥46	140	28.00
Mean ± SD (years)	38.70 ± 10.24	
Gender		
Male	300	60.00
Female	200	40.00
Marital status		
Unmarried	108	21.60
Married	392	78.40
Education		
Illiterates	55	11.00
Primary	126	25.20
Secondary	206	41.20
Degree and above	113	22.60
Family type		
Nuclear	342	68.40
Joint	158	31.60
Monthly family income		
Lower SES	181	36.20
Middle SES	198	39.60
Upper SES	121	24.20
Total	500	100.00

Abbreviations: SD, standard deviation; SES, socioeconomic status.

Attitudes toward the COVID-19 Vaccine

The distribution of each of the attitude items toward the COVID-19 vaccine is presented in ►**Table 5**. The overall mean percentage of attitudes about the COVID-19 vaccine is 79.499.67. Males had significantly higher attitudes toward the COVID-19 vaccine, which is critical; I will also encourage my family, friends, and relatives to get vaccinated; and the COVID-19 vaccine should be distributed fairly to all of us in comparison to their counterparts (►**Table 5**). In multiple linear regression analysis, the urban area as a residence, married status, and higher education factors were shown and found to be significant factors in the prediction of positive attitudes toward the COVID-19 vaccine. The regression model R is 0.4209 and F=15.1380, which is found to be statistically significant ($p < 0.05$) with standard error of estimate being 8.8300 (►**Table 4**).

Knowledge Items

- Do you have knowledge of the COVID-19 vaccine? Yes/no/don't know
- Do you have knowledge of the goodness of the COVID-19 vaccine? Yes/no/don't know
- Is it possible to use overdose vaccines? Yes/no/don't know
- Do these vaccines increase harmful reactions? Yes/no/I don't know
- Do vaccines worsen autoimmune diseases? Yes/no/don't know
- Do vaccines improve the tension of allergic diseases? Yes/no/don't know

Attitude Items

- The novel COVID-19 vaccine is safe. Disagree/undecided/agree
- The COVID-19 vaccine is a must for us. Disagree/undecided/agree
- If available, we have no hesitation in taking the vaccine. Disagree/undecided/agree

Table 2 Comparison of sex difference in each knowledge item

Knowledge items	Male	%	Female	%	Total	%	χ²	p-Value
Do you know about the COVID-19 vaccine?	189	63.00	104	52.00	293	58.60	5.9850	0.0140[a]
Do you know about the effectiveness of COVID-19 vaccine?	209	69.67	127	63.50	336	67.20	2.0700	0.1500
Is it dangerous to use overdose vaccines?	201	67.00	118	59.00	319	63.80	3.3250	0.0680
Does vaccination increase allergic reactions?	237	79.00	157	78.50	394	78.80	0.0180	0.8930
Does vaccination increase autoimmune diseases?	162	54.00	101	50.50	263	52.60	0.5900	0.4430
Does vaccination decrease the tension of autoimmune diseases?	187	62.33	110	55.00	297	59.40	2.6760	0.1020

Abbreviation: COVID-19, coronavirus disease 2019.
[a]Statistically significant.

Table 3 Comparison of location difference in each knowledge item

Knowledge items	Rural	%	Urban	%	Total	%	χ^2	p-Value
Do you know about the COVID-19 vaccine?	129	51.60	164	65.60	293	58.60	10.0990	0.0010[a]
Do you know about the effectiveness of COVID-19 vaccine?	148	59.20	188	75.20	336	67.20	14.5180	0.0001[a]
Is it dangerous to use overdose vaccines?	144	57.60	175	70.00	319	63.80	8.3220	0.0040[a]
Does vaccination increase allergic reactions?	179	71.60	215	86.00	394	78.80	15.5160	0.0001[a]
Does vaccination increase autoimmune diseases?	133	53.20	130	52.00	263	52.60	0.0720	0.7880
Does vaccination decrease the tension of autoimmune diseases?	128	51.20	169	67.60	297	59.40	13.9410	0.0001[a]

Abbreviation: COVID-19, coronavirus disease 2019.
[a]Statistically significant.

Table 4 Multiple linear regression analysis of knowledge and attitude scores

Dependent variable	Independent variables	Estimates	SE	t-Value	p-Value
Knowledge	Intercept	12.1725	5.7697	2.1097	0.0354[a]
	Gender	−2.7941	1.6019	−1.7442	0.0818
	Area of resident	13.7643	1.5229	9.0384	0.0001[a]
	Age in years	−0.2117	0.6923	−0.3058	0.7599
	Marital	8.8639	1.8151	4.8834	0.0001[a]
	Education	7.1103	0.8235	8.6339	0.0001[a]
	Type of family	−2.1180	1.6846	−1.2573	0.2093
	SES	1.3091	0.9526	1.3742	0.1700
	R = 0.5828, R^2 = 0.3397, F(7,492) = 36.164 $p < 0.05$,S, SE of estimate: 15.480				
Attitudes	Intercept	71.1188	3.2912	21.6091	0.0001[a]
	Gender	1.3125	0.9138	1.4363	0.1515
	Area of resident	5.7719	0.8687	6.6445	0.0001[a]
	Age in years	−0.4823	0.3949	−1.2213	0.2226
	Marital	−3.2401	1.0354	−3.1294	0.0019[a]
	Education	2.6546	0.4698	5.6509	0.0001[a]
	Type of family	−1.7770	0.9609	−1.8493	0.0650
	SES	−0.0028	0.5434	−0.0051	0.9959
	R = 0.4209, R^2 = 0.1772, F(7,492) = 15.138 $p < 0.05$, SE estimate: 8.8300				

Abbreviations: SE, standard error; SES, socioeconomic status.
[a]$p < 0.05$.

- We encourage our kith and kin to take the COVID-19 vaccine. Disagree/undecided/agree
- Without the COVID-19 vaccine, it is not possible to control COVID-19. Disagree/undecided/agree
- The COVID-19 vaccine should be given world-wide. Disagree/undecided/agree

Discussion

COVID-19 is a new disease affecting the entire world. It has caused deaths, suffering, and hardships for people everywhere. There were many ways to contain the disease, and one such effort was the development of vaccines. Earlier, the development of any vaccine, from beginning to use in persons,

took 10 to 15 years, with all the conventional precautions. In the case of COVID-19 disease, considering the urgency, pandemic situation, and the technological advances, swift mechanism was to put in place to alleviate the disease.

As a result, all of us must be aware of the risks and benefits of the vaccine to make an informed decision about using it. In this scenario, adequate precautions are taken to put in a good, useful vaccine. The government has advocated and supported its use. The essential information is widely dispersed in the media so that people can make a choice and take the vaccine sportively. The vaccine has distributive value; it protects the person, family, and the community. Hence, the more people vaccinated, the greater the benefit to

Table 5 Comparison of sex difference in each attitude item

Items	Male	%	Female	%	Total	%	χ^2	p-Value
The newly discovered COVID-19 vaccine is safe								
Disagree	8	2.67	10	5.00	18	3.60	5.4380	0.066
Agree	104	34.67	84	42.00	188	37.60		
Undecided	188	62.67	106	53.00	294	58.80		
The COVID-19 vaccine is essential for us								
Disagree	43	14.33	23	11.50	66	13.20	10.3390	0.006[a]
Agree	178	59.33	97	48.50	275	55.00		
Undecided	79	26.33	80	40.00	159	31.80		
I will take the COVID-19 vaccine without any hesitation, if it is available								
Disagree	29	9.67	15	7.50	44	8.80	2.1830	0.336
Agree	109	36.33	85	42.50	194	38.80		
Undecided	162	54.00	100	50.00	262	52.40		
I will also encourage my family/friends/relatives to get vaccinated								
Disagree	30	10.00	36	18.00	66	13.20	6.7320	0.035[a]
Agree	101	33.67	60	30.00	161	32.20		
Undecided	169	56.33	104	52.00	273	54.60		
It is not possible to reduce the incidence of COVID-19 without vaccination								
Disagree	54	18.00	23	11.50	77	15.40	4.2680	0.118
Agree	108	36.00	83	41.50	191	38.20		
Undecided	138	46.00	94	47.00	232	46.40		
The COVID-19 vaccine should be distributed fairly to all of us								
Disagree	17	5.67	8	4.00	25	5.00	6.6660	0.036[a]
Agree	159	53.00	86	43.00	245	49.00		
Undecided	124	41.33	106	53.00	230	46.00		
Total	300	100.0	200	100.0	500	100.00		

Abbreviation: COVID-19, coronavirus disease 2019.
[a]$p < 0.05$.

the community. The people, whether individually or collectively, make a decision fully knowing there is no zero risk. The study conducted online when the vaccine was just ready, not yet released for use revealed half the participants unwilling to take the shots, while only one-third of participants favored to take shots.

Our study looks at the various dynamics of availing the COVID-19 vaccine across a sociodemographic profile. Do urban and rural location, male or female gender, literate or illiterate educational level, and rich or poor economic status impact vaccine coverage? The study was inclusive because data collected by direct face to face interview, while most of the studies so far have done online survey. There was only one study where data was collected by small focused group discussion. There were three systematic review studies worldwide using structured questionnaire.

In all these studies, notable finding is inadequate knowledge, fear of side effects; however, people have favorable attitude in view of crisis.

Regardless of how hard governments and leaders push for COVID-19 vaccine acceptance, inherent issues, such as efficacy, side effects, and the validity of a vaccine being put up in such a short period of time, ignoring trials, are bound to arise, and such dissenting voices are heard louder than others. The movie "Contagion," chivalrous behavior of prominent political leaders, noted scientists discordance with vaccine, do circulate in the social media. Such impacts on knowledge are expressed in studies from Saudi Arabia and other regions.

People also observe all the events like procedure, follow up, side effects, attendance of people at the vaccination center. If someone among them gets side effects, such incidents spread faster, mouth to mouth, and are bound to impact the opinion of the individuals. We have such perceptions that are echoed in several studies from India.[9–18]

The findings from all these studies have enriched the literature, online studies, using variety of tools, scooping the social media and consistently reaching that people have fairly good knowledge (three out of five scale) and favorable attitude toward acceptance sans clarity on side effects. Our study findings are consistent with studies referred to, with a knowledge score of 63.40% and an attitude score of 79.49%, and there is need to address the information education

campaign tailor-made for people toward clarity on side effects.[19–21]

Conclusion

The population has fair knowledge of access to vaccine and favorable attitude to accept COVID-19 vaccine.

Author Contributions
C.M.M. conceptualized and designed the study. S.B.J. was involved in methodology, data analysis, interpretation, and graphic representation. M.A.S. contributed to data collection, compilation, manuscript handling, monitoring, and correspondence.

Note
Our findings reveal the general population has adequate knowledge and a positive attitude toward COVID-19 vaccinations.

Conflict of Interest
None declared.

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