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Original Research Article

Is COVID-19 a hoax? Correlation between beliefs related to COVID-19 and the use of preventive measures in India

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ABSTRACT

Background: Following the personal protective and preventive measures are vital to the control and prevention of transmission. The populations' beliefs and attitude related to coronavirus disease 2019 (COVID-19) have a direct impact on their practice of preventive measures. Therefore, this study was conducted to explore the beliefs, attitude and preventive practices related to COVID-19 among the general population of Chennai, Tamil Nadu.
Methods: An online questionnaire with 12 questions concerning the beliefs, attitude and practice of preventive measures related to COVID-19 was distributed via social platforms. Data were entered in Microsoft Excel spreadsheet and analyzed using statistical package for social sciences (SPSS) software (version 21, IBM Corporation, Texas, USA). Bivariate analysis (Chi-square test) was used to assess the association between independent variables with each of the main outcomes of interest.
Results: A total of 256 study subjects participated in this survey. About 69.9% believed in the existence of corona virus and >85% followed the government protocols. Social distancing and Frequent hand washing was chosen by majority of the study subjects (55.5% and 78.5% respectively) as the most effective measure to prevent viral transmission. Nearly 81.7% always wore a mask in public and 27.0% always kept >6 feet distance apart from others.
Conclusions: The surveyed population has an acceptable level of positive beliefs, attitude, and good practices towards COVID-19. We recommend that emphasis should be placed on educating people belonging to lower education and income strata. Vulnerable populations who require proper health education and guidance for prevention and control of COVID-19 should be targeted.

Keywords: COVID-19, Corona virus, Prevention, Social distancing

INTRODUCTION

The Spanish influenza pandemic 1918-1919 which caused 50 million deaths worldwide remains an ominous warning to public health. An estimated 1/3rd of the world's population were infected and had clinically apparent illness during 1918-1919 influenza pandemic.[1] In the last 20 years several viral epidemics such as severe acute respiratory syndrome (SARS-COV) from 2002-2003, H1N1 influenza in 2009, MERS-COV (Middle eastern respiratory syndrome) in 2012 have plagued the world.[2]

More recently, an alarming rate of cases of novel Corona virus (COVID-19) have been reported across the world since December 2019. Ever since the first case of COVID-19 was confirmed in Hubei province of China, Countries were forced to take unprecedented measures to prevent the rapid spread of this virus. Most countries closed their borders, announced lockdowns, and asked people to follow protective measures against the new corona virus, such as physical distancing and hand washing. Governments and non-governmental organisations across the globe

promoted and legally prescribed behaviour to prevent and control the transmission rate.

On one hand, majority of the world population was following the preventive measures to limit person to person transmission of the virus. On the other hand, the corona virus crisis became an ideal breeding ground for speculations and conspiracy thinking.[3] Research over the decades has shown that conspiracy theories increase substantially during a crisis such as a pandemic.[4] A review reported on the alarming results of a survey conducted in United States showed that 49% believed corona virus is a man made epidemic, 44% thought that the threat of COVID-19 is being exaggerated for political reasons and 13% were convinced that corona virus is a hoax.[5]

People who accept the conspiracy theories as true are most likely to not follow the public health orders to control the infection rates.[5] Following the personal protective and preventive measures are vital to the control and prevention of transmission. The populations' beliefs and attitude related to COVID-19 have a direct impact on their practice of preventive measures. Therefore, this study was conducted to explore the beliefs, attitude and preventive practices related to COVID-19 among the general population of Chennai, Tamil Nadu.

METHODS

Ethical approval

Ethical approval for this study was obtained from the Institutional Scientific review board. Participation in the survey was taken as implied consent and the anonymity of the participants was maintained.

Questionnaire

The questionnaire was adapted from a previously published study.(6) The questionnaire was pretested on a sample of 30 subjects to test the validity and reliability of the questionnaire. The responses of these participants were excluded from the main study. The final and validated version was developed. It consisted of 12 questions concerning the beliefs, attitude and practice of preventive measures related to COVID-19.

Study population and data collection

As it was not feasible to do an entire community based sampling survey during this period, an online survey was conducted. Google form was utilized to collect the data using a link that was circulated via various social platforms such as Watsapp, Facebook and Instagram. The Google Form contained the declarations of anonymity and confidentiality and instructions for filling in the questionnaire. The questionnaire was collected from December, 2020 to February, 2021. Participants had to be 18 years or older to be included in the survey.

Statistical analysis

Responses were coded and entered into an SPSS database. Data were entered in Microsoft Excel spreadsheet and analyzed using statistical package for social sciences (SPSS) software (version 21, IBM Corporation, Texas, USA). Descriptive statistics were conducted. Bivariate analysis (Chi-square test) was used to assess the association between independent variables with each of the main outcomes of interest.

RESULTS

Table 1 shows the distribution of study subjects. A total of 256 study subjects participated in this survey, of which 209 (81.6%) and 47 (18.4%) belonged to the age group of ≤40 and ≥41 years respectively.

Table 1: Distribution of study subjects.

Variable	Categories	Number	Percentage
Age (in years)	≤40	209	81.6
	≥41	47	18.4
Gender	Male	126	49.2
	Female	130	50.8
Place of Origin	Rural	144	56.3
	Urban	112	43.8
Level of Education	Illiterate	3	1.2
	Completed school	63	24.6
	Diploma	13	5.1
	Graduate	111	43.4
	Professional	66	25.8
Employment Status	Essential employment	21	8.2
	Non-Essential Employment	177	69.1
	Retired	2	.8
	Unemployed	54	21.1

About 49.2% and 50.8% were males and females respectively. Majority of the study subjects (144(56.3%) hailed from a rural region when compared to 112 study subjects (43.8%) belonged to an urban area. Only 3 (1.2%) of our study subjects said they had not attended school, 111 (43.3%) study subjects were graduates and 66 (25.8%) subjects were professionals.

Table 2 shows the aggregate responses to the questions about the beliefs, attitudes and practices related to COVID-19. About 69.9% of the participants thought that corona virus actually exists, most of the respondents (63.3%) also felt the complete lockdown was effective in controlling the spread of the virus. However, 57.8% study subjects attributed the pandemic to man-made biological warfare. Majority of the subjects (>85%) followed the protocols advised by the government, but only 51.6% believed that the virus can be contained by the preventive measures taken by the government.

Table 2: Aggregate responses to the questions about the beliefs, attitudes and practices related to COVID-19.

Questions	Responses	Number	Percentage
Do you think corona virus actually exist?	Yes	179	69.9
	No	40	15.6
	May be	37	14.5
Do you think the complete lockdown was effective/necessary in controlling the viral spread?	Yes	162	63.3
	No	57	22.3
	May be	37	14.5
What do you think might be the reason of this pandemic?	Natural virus	90	35.2
	Man-made biological warfare	148	57.8
	Fake propaganda	18	7.0
Do you believe the virus can be contained by the preventive measures taken by the government?	Yes	132	51.6
	No	46	18.0
	May be	78	30.5
Do you follow the protocols advised by the government?	Yes	220	85.9
	No	14	5.5
	May be	22	8.6
What do you think is the most effective preventive measure to stop the viral transmission?	Social distancing	142	55.5
	Hand sanitizer	16	6.3
	Mask	98	38.3
What kind of protective measure do you use at home?	Hand sanitizer	41	16.0
	Mask	14	5.5
	Frequent hand washing	201	78.5
How often do you use hand sanitizer?	<3 times/day	84	32.8
	3-5 times/day	89	34.8
	>5 times/day	83	32.4
What do you think is the most effective type of mask?	1-PLY	66	25.8
	2-PLY	66	25.8
	3-PLY	124	48.4
Do you think there can be any kind of cross contamination from the disposed mask?	Yes	158	61.7
	No	31	12.1
	May be	67	26.2
Do you wear a mask when in public?	Always	225	87.9
	Often	19	7.4
	Sometimes	10	3.9
	Never	2	.8
Do you keep ≥6 feet distance apart from others?	Always	69	27.0
	Often	53	20.7
	Sometimes	103	40.2
	Never	31	12.1

Social distancing and Frequent hand washing was chosen by majority of the study subjects (55.5% and 78.5% respectively) as the most effective preventive and protective measure to stop viral transmission. Most of the participants 34.8% used hand sanitizer 3-5times /day. About 48.4% of the participants thought that the 3 PLY mask is the most effective type of mask. Nearly 61.7% of participants thought there could be cross contamination from a disposed mask, 81.7% always wore a mask in public and 27.0% of the participants always kept >6 feet distance apart from others. (Table 2)

Table 3 shows the attitudes, beliefs and behaviors related to COVID-19 based on Place of Origin and Gender. Less number of subjects (64.6%) belonging to rural regions believed that corona virus actually exists when compared to 76.8% urban study subjects, however this difference was not statistically significant. For the same question, more females (76.2%) stated they thought corona virus actually exist when compared to 63.5% males believed the same ($p<0.03$). About 36.9% females also believed the virus can be contained by the preventive measures taken by the government; this was statistically different when compared to males (23.8%) ($p<0.02$).

Table 3: Attitudes, beliefs and behaviors related to COVID-19 based on place of origin and gender.

Attitudes, behaviors, and beliefs	Responses	Place of origin N (%)		P value	Gender		P value
		Rural	Urban		Male	Female	
Do you think corona virus actually exist?	Yes	93 (64.6)	86 (76.8)	0.085	80 (63.5)	99 (76.2)	0.032
	No	28 (19.4)	12 (10.7)		27 (21.4)	13 (10.0)	
	May be	23 (16.00	14 (12.5)		19 (15.1)	18 (13.8)	
Do you think the complete lockdown was effective/necessary in controlling the viral spread?	Yes	83 (57.60	79 (70.5)	0.105	74 (58.7)	88 (67.7)	0.192
	No	37 (25.7)	20 (17.9)		34 (27.0)	23 (17.7)	
	May be	24 (16.7)	13(11.6)		18 (14.3)	19 (14.6)	
What do you think might be the reason of this pandemic?	Natural virus	52 (36.1)	38 (33.9)	0.557	46 (36.5)	44 (33.8)	0.855
	Man made virus	80 (55.6)	68(60.7)		72 (57.1)	76 (58.5)	
	Fake propaganda	12 (8.3)	6 (5.4)		8 (6.3)	10 (7.7)	
Do you believe the virus can be contained by the preventive measures taken by the government?	Yes	82 (56.9)	50 (44.6)	0.138	67 (53.2)	65 (50.0)	0.027
	No	24 (16.7)	22 (19.6)		29 (23.0)	17 (13.1)	
	May be	38 (26.4)	40 (35.7)		30 (23.8)	48 (36.9)	
Do you follow the protocols advised by the government?	Yes	126 (87.5)	94 (83.9)	0.085	105 (83.3)	11 5(88.5)	0.227
	No	10 (6.9)	4 (3.6)		10 (7.9)	4 (3.1)	
	May be	8 (5.6)	14 (12.5)		11 (8.7)	11 (8.5)	
What do you think is the most effective preventive measure to stop the viral transmission?	Social distancing	80 (55.6)	62 (55.4)	0.999	70 (55.6)	72 (55.4)	0.513
	Hand sanitizer	9 (6.2)	7 (6.2)		10 (7.9)	6 (4.6)	
	Mask	55 (38.2)	43 (38.4)		46 (36.5)	52 (40.0)	
What kind of protective measure do you use at home?	Hand sanitizer	25 (17.4)	16 (14.3)	0.001	27 (21.4)	14 (10.8)	0.046
	Mask	1 (0.7)	13(11.6)		8 (6.3)	6 (4.6)	
	Frequent hand washing	118 (81.9)	83 (74.1)		91 (72.2)	110 (84.6)	
How often do you use hand sanitizer?	<3 times/day	54 (37.5)	30 (26.8)	0.176	45 (35.7)	39 (30.0)	0.622
	3-5 times/day	48 (33.3)	41 (36.6)		42 (33.3)	47 (36.2)	
	>5 times/day	42 (29.2)	41 (36.6)		39 (31.0)	44 (33.8)	
What do you think is the most effective type of mask?	1-PLY	48 (33.3)	18 (16.1)	0.007	42 (33.3)	24 (18.5)	0.001
	2-PLY	32 (22.2)	34 (30.4)		37 (29.4)	29 (22.3)	
	3-PLY	64 (44.4)	60 (53.6)		47 (37.3)	77 (59.2)	
Do you think there can be any kind of cross contamination from the disposed mask?	Yes	87 (60.4)	71 (63.4)	0.613	74 (58.7)	84 (64.6)	0.011
	No	20 (13.9)	11 (9.8)		23 (18.3)	8 (6.2)	
	May be	37 (25.7)	30 (26.8)		29 (23.0)	38 (29.2)	
Do you wear a mask when in public?	Always	130 (90.3)	95 (84.8)	0.126	110 (87.3)	115 (88.5)	0.992
	Often	6 (4.2)	13 (11.6)		10 (7.9)	9 (6.9)	
	Sometimes	7 (4.9)	3 (2.7)		5 (4.0)	5 (3.8)	
	Never	1 (0.7)	1 (0.9)		1 (0.8)	1 (0.8)	
Do you keep ≥6 feet	Always	43 (29.9)	26 (23.2)	0.580	29 (23.0)	40 (30.8)	0.253
	Often	30 (20.8)	23 (20.5)		23 (18.3)	30 (23.1)	

Continued.

Attitudes, behaviors, and beliefs	Responses	Place of origin N (%)		P value	Gender		P value
		Rural	Urban		Male	Female	
distance apart from others?	Sometimes	56 (38.9)	47 (42.0)		57 (45.2)	46 (35.4)	
	Never	15 (10.4)	16 (14.3)		17 (13.5)	14 (10.8)	

Table 4: Attitudes, beliefs and behaviors related to COVID-19 based on age groups.

Questions	Responses	Age groups		Chi square	P value
		≤40 years	≥41 years		
Do you think corona virus actually exist?	Yes	150 (71.8)	29 (61.7)	1.996	0.36
	No	30 (14.4)	10 (21.3)		
	May be	29 (13.9)	8 (17.0)		
Do you think the complete lockdown was effective/necessary in controlling the viral spread?	Yes	128 (61.2)	34 (72.3)	4.922	0.08
	No	46 (22.0)	11 (23.4)		
	May be	35 (16.7)	2 (4.3)		
What do you think might be the reason of this pandemic?	Natural virus	75 (35.9)	15 (31.9)	1.239	0.53
	Man made virus	121 (57.9)	27 (57.4)		
	Fake propaganda	13 (6.2)	5 (10.6)		
Do you believe the virus can be contained by the preventive measures taken by the government?	Yes	102 (48.8)	30 (63.8)	3.580	0.16
	No	39 (18.7)	7 (14.9)		
	May be	68 (32.5)	10 (21.3)		
Do you follow the protocols advised by the government?	Yes	177 (84.7)	43 (91.5)	1.622	0.44
	No	12 (5.7)	2 (4.3)		
	May be	20 (9.6)	2 (4.3)		
What do you think is the most effective preventive measure to stop the viral transmission?	Social distancing	123 (58.9)	19 (40.4)	5.694	0.05
	Hand sanitizer	13 (6.2)	3 (6.4)		
	Mask	73 (34.9)	25 (53.2)		
What kind of protective measure do you use at home?	Hand sanitizer	38 (18.2)	3 (6.4)	4.628	0.09
	Mask	10 (4.8)	4 (8.5)		
	Frequent hand washing	161 (77.0)	40 (85.1)		
How often do you use hand sanitizer?	<3 times/day	65 (31.1)	19 (40.4)	3.404	0.18
	3-5 times/day	78 (37.3)	11 (23.4)		
	>5 times/day	66 (31.6)	17 (36.2)		
What do you think is the most effective type of mask?	1-PLY	50 (23.9)	16 (34.0)	4.827	0.09
	2-PLY	51 (24.4)	15 (31.9)		
	3-PLY	108 (51.7)	16 (34.0)		
Do you think there can be any kind of cross contamination from the disposed mask?	Yes	136 (65.1)	22 (46.8)	31.438	0.001
	No	14 (6.7)	17 (36.2)		
	May be	59 (28.2)	8 (17.0)		
Do you wear a mask when in public?	Always	184 (88.0)	41 (87.2)	1.721	0.63
	Often	14 (6.7)	5 (10.6)		
	Sometimes	9 (4.3)	1 (2.1)		
	Never	2 (1.0)	0 (0.0)		
Do you keep ≥6 feet distance apart from others?	Always	54 (25.8)	15 (31.9)	9.111	0.69
	Often	45 (21.5)	8 (17.0)		
	Sometimes	83 (39.7)	20 (42.6)		
	Never	27 (12.9)	4 (8.5)		

Table 5: Attitudes, beliefs and behaviors related to COVID-19 based on level of education.

Attitudes, behaviors, and beliefs	Responses	Level Of Education				Chi square	P value
		Illiterate	Completed School	Graduate or higher	Professional		
Do you think corona virus actually exist?	Yes	1 (33.3%)	32 (50.8%)	93 (75.0)	53 (80.3%)	26.821	0.000
	No	0 (0.0%)	20 (31.7%)	13 (10.5)	7 (10.6%)		
	May be	2 (66.7%)	11 (17.5%)	18 (14.5)	6 (9.1%)		

Continued.

Attitudes, behaviors, and beliefs	Responses	Level Of Education				Chi square	P value
		Illiterate	Completed School	Graduate or higher	Professional		
Do you think the complete lockdown was effective/necessary in controlling the viral spread?	Yes	2 (66.7%)	41 (65.1%)	73 (58.9)	46 (69.7%)	6.448	0.375
	No	1 (33.3%)	17 (27.0%)	29 (23.4)	10 (15.2%)		
	May be	0 (0.0%)	5 (7.9%)	22 (17.7)	10 (15.2%)		
What do you think might be the reason of this pandemic?	Natural virus	1 (33.3%)	29 (46.0%)	50 (40.3)	10 (15.2%)	28.426	0.000
	Man made virus	1 (33.3%)	26 (41.3%)	67 (54.0)	54 (81.8%)		
	Fake propaganda	1 (33.3%)	8 (12.7%)	7 (5.6)	2 (3.0%)		
Do you believe the virus can be contained by the preventive measures taken by the government?	Yes	2 (66.7%)	42 (66.7%)	64 (51.6)	24 (36.4%)	20.037	0.003
	No	1 (33.3%)	13 (20.6%)	21 (16.9)	11 (16.7%)		
	May be	0 (0.0%)	8 (12.7%)	39 (31.5)	31 (47.0%)		
Do you follow the protocols advised by the government?	Yes	2 (66.7%)	55 (87.3%)	104 (83.9)	59 (89.4%)	10.670	0.221
	No	1 (33.3%)	3 (4.8%)	5 (4.0)	5 (7.6%)		
	May be	0 (0.0%)	5 (7.9%)	15 (12.1)	2 (3.0%)		
What do you think is the most effective preventive measure to stop the viral transmission?	Social distancing	1 (33.3%)	25 (39.7%)	76 (61.3)	40 (60.6%)	20.996	0.002
	Hand sanitizer	0 (0.0%)	2 (3.2%)	13 (10.5)	1 (1.5%)		
	Mask	2 (66.7%)	36 (57.1%)	35 (28.2)	25 (37.9%)		
What kind of protective measure do you use at home?	Hand sanitizer	0 (0.0%)	7 (11.1%)	26 (21.0)	8 (12.1%)	5.230	0.515
	Mask	0 (0.0%)	4 (6.3%)	7 (5.6)	3 (4.5%)		
	Frequent hand washing	3 (100.0%)	52 (82.5%)	91 (73.4)	55 (83.3%)		
How often do you use hand sanitizer?	<3 times/day	2 (66.7%)	30 (47.6%)	38 (30.6)	14 (21.2%)	17.034	0.009
	3-5 times/day	0 (0.0%)	23 (36.5%)	42 (33.9)	24 (36.4%)		
	>5 times/day	1 (33.3%)	10 (15.9%)	44 (35.5)	28 (42.4%)		
What do you think is the most effective type of mask?	1-PLY	2 (66.7%)	39 (61.9%)	15 (12.1)	10 (15.2%)	67.561	0.000
	2-PLY	1 (33.3%)	12 (19.0%)	39 (31.5)	14 (21.2%)		
	3-PLY	0 (0.0%)	12 (19.0%)	70 (56.5)	42 (63.6%)		
Do you think there can be any kind of cross contamination from the disposed mask?	Yes	2 (66.7%)	36 (57.1%)	84 (67.7)	36 (54.5%)	18.187	0.006
	No	1 (33.3%)	15 (23.8%)	10 (8.1)	5 (7.6%)		
	May be	0 (0.0%)	12 (19.0%)	30 (24.2)	25 (37.9%)		
Do you wear a mask when in public?	Always	2 (66.7%)	57 (90.5%)	103 (83.1)	63 (95.5%)	22.352	0.008
	Often	0 (0.0%)	2 (3.2%)	14 (11.3)	3 (4.5%)		
	Sometimes	1 (33.3%)	2 (3.2%)	7 (5.6)	0 (0.0%)		
	Never	0 (0.0%)	2 (3.2%)	0 (0.0)	0 (0.0%)		
Do you keep ≥6 feet distance apart from others?	Always	1 (33.3%)	16 (25.4%)	42 (33.9)	10 (15.2%)	27.169	0.007
	Often	0 (0.0%)	10 (15.9%)	30 (24.2)	13 (19.7%)		
	Sometimes	2 (66.7%)	24 (38.1%)	40 (32.3)	37 (56.1%)		
	Never	0 (0.0%)	13 (20.6%)	12 (9.7)	6 (9.1%)		

Table 6: Attitudes, beliefs and behaviors related to COVID-19 based on employment status.

Attitudes, behaviors, and beliefs	Responses	Employment status				Chi square	P value
		Essential employment	Non Essential Employment	Retired	Unemployed		
Do you think corona virus actually exist?	Yes	18 (85.7%)	121 (68.4%)	0 (0.0%)	39 (72.2%)	14.874	0.021
	No	1 (4.8%)	30 (16.9)	0 (0.0%)	8 (14.8%)		
	May be	2 (9.5%)	26 (14.7%)	2 (100.0%)	7 (13.0%)		
Do you think the complete lockdown was effective/necessary in controlling the viral spread?	Yes	14 (66.7%)	111 (62.7%)	1 (50.0%)	34 (63.0%)	2.049	0.915
	No	3 (14.3%)	41 (23.2%)	1 (50.0%)	12 (22.2%)		
	May be	4 (19.0%)	25 (14.1%)	0 (0.0%)	8 (14.8%)		
What do you think might be the reason of this pandemic?	Natural virus	8 (38.1%)	59 (33.3%)	1 (50.0%)	21 (38.9%)	2.982	0.811
	Man made virus	13 (61.9%)	103 (58.2%)	1 (50.0%)	30 (55.6%)		
	Fake propaganda	0 (0.0%)	15 (8.5%)	0 (0.0%)	3 (5.6%)		
Do you believe the virus can be contained by the preventive measures taken by the government?	Yes	9 (42.9%)	91 (51.4%)	2 (100.0%)	28 (51.9%)	4.202	0.649
	No	4 (19.0%)	35 (19.8%)	0 (0.0%)	7 (13.0%)		
	May be	8 (38.1%)	51 (28.8%)	0 (0.0%)	19 (35.2%)		
Do you follow the protocols advised by the government?	Yes	19 (90.5%)	146 (82.5%)	2 (100.0%)	51 (94.4%)	6.592	0.360
	No	1 (4.8%)	13 (7.3%)	0 (0.0%)	0 (0.0%)		
	May be	1 (4.8%)	18 (10.2%)	0 (0.0%)	3 (5.6%)		
What do you think is the most effective preventive measure to stop the viral transmission?	Social distancing	13 (61.9%)	105 (59.3%)	0(0.0%)	22 (40.7%)	10.872	0.092
	Hand sanitizer	2 (9.5%)	11 (6.2%)	0 (0.0%)	3 (5.6%)		
	Mask	6 (28.6%)	61 (34.5%)	2 (100.0%)	29 (53.7%)		
What kind of protective measure do you use at home?	Hand sanitizer	2 (9.5%)	29 (16.4%)	0 (0.0%)	9 (16.7%)	3.579	0.733
	Mask	0 (0.0%)	12 (6.8%)	0 (0.0%)	2 (3.7%)		
	Frequent hand washing	19 (90.5%)	136 (76.8%)	2 (100.0%)	43 (79.6%)		
How often do you use hand sanitizer?	<3 times/day	2 (9.5%)	65 (36.7%)	2 (100.0%)	15 (27.8%)	12.242	0.057
	3-5 times/day	10 (47.6%)	55 (31.1%)	0 (0.0%)	23 (42.6%)		
	>5 times/day	9 (42.9%)	57 (32.2%)	0 (0.0%)	16 (29.6%)		
What do you think is the most effective type of mask?	1-PLY	0 (0.0%)	49 (27.7%)	2 (100.0%)	15 (27.8%)	22.499	0.001
	2-PLY	3 (14.3%)	53 (29.9%)	0 (0.0%)	10 (18.5%)		
	3-PLY	18 (85.7%)	75 (42.4%)	0 (0.0%)	29 (53.7%)		
Do you think there can be any kind of cross contamination from the disposed mask?	Yes	11 (52.4%)	112 (63.3%)	1 (50.0%)	33 (61.1%)	10.547	0.103
	No	0 (0.0%)	24 (13.6%)	1 (50.0%)	6 (11.1%)		
	May be	10 (47.6%)	41 (23.2%)	0 (0.0%)	15 (27.8%)		
Do you wear a mask when in public?	Always	20 (95.2%)	148 (83.6%)	2 (100.0%)	53 (98.1%)	10.250	0.331
	Often	1 (4.8%)	18 (10.2%)	0 (0.0%)	0 (0.0%)		

Continued.

Attitudes, behaviors, and beliefs	Responses	Employment status				Chi square	P value
		Essential employment	Non Essential Employment	Retired	Unemployed		
	Sometimes	0 (0.0%)	9 (5.1%)	0 (0.0%)	1 (1.9%)		
	Never	0 (0.0%)	2 (1.1%)	0 (0.0%)	0 (0.0%)		
Do you keep >=6 feet distance apart from others?	Always	5 (23.8%)	45 (25.4%)	0 (0.0%)	17 (31.5%)	10.793	0.290
	Often	6 (28.6%)	34 (19.2%)	0 (0.0%)	13 (24.1%)		
	Sometimes	9 (42.9%)	70 (39.5%)	2 (100.0%)	22 (40.7%)		
	Never	1 (4.8%)	28 (15.8%)	0 (0.0%)	2 (3.7%)		

Table 7: Association between questions related to beliefs and practices.

Questions	Responses	Do you think the complete lockdown was effective/necessary in controlling the viral spread?						Total		Chi Square	P value
		Yes		No		May Be					
		N	%	N	%	N	%	N	%		
Do you follow the protocols advised by the government?	Yes	160	89.4%	31	77.5%	29	78.4%	220	85.9%	13.101	0.01
	No	4	2.2%	6	15.0%	4	10.8%	14	5.5%		
	May Be	15	8.4%	3	7.5%	4	10.8%	22	8.6%		
Do you wear a mask when in public?	Always	157	87.7%	37	92.5%	31	83.8%	225	87.9%	6.768	0.34
	Often	16	8.9%	1	2.5%	2	5.4%	19	7.4%		
	Sometimes	6	3.4%	2	5.0%	4	10.8%	12	4.7%		
	Never	1	0.6%	0	0.0%	1	2.7%	2	0.8%		
Do you keep ≥ 6 feet distance apart from others?	Always	46	25.7%	12	30.0%	11	29.7%	69	27.0%	8.484	0.20
	Often	45	25.1%	6	15.0%	2	5.4%	53	20.7%		
	Sometimes	67	37.4%	17	42.5%	19	51.4%	103	40.2%		
	Never	21	11.7%	5	12.5%	5	13.5%	31	12.1%		
Questions	**Responses**	**Do you think the complete lockdown was effective/necessary in controlling the viral spread?**						**Total**		**Chi Square**	**P value**
		Yes		**No**		**May Be**					
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**		
Do you follow the protocols advised by the government?	Yes	149	92.0%	41	71.9%	30	81.1%	220	85.9%	19.568	0.001
	No	2	1.2%	8	14.0%	4	10.8%	14	5.5%		
	May Be	11	6.8%	8	14.0%	3	8.1%	22	8.6%		
Do you wear a mask when in public?	Always	149	92.0%	44	77.2%	32	86.5%	225	87.9%	14.150	0.02
	Often	10	6.2%	6	10.5%	3	8.1%	19	7.4%		
	Sometimes	3	1.9%	6	10.5%	1	2.7%	10	3.9%		
	Never	0	0.0%	1	1.8%	1	2.7%	2	0.8%		
Do you keep >=6 feet distance apart from others?	Always	52	32.1%	9	15.8%	8	21.6%	69	27.0%	25.446	0.001
	Often	35	21.6%	10	17.5%	8	21.6%	53	20.7%		
	Sometimes	63	38.9%	21	36.8%	19	51.4%	103	40.2%		
	Never	12	7.4%	17	29.8%	2	5.4%	31	12.1%		
Questions	**Responses**	**What do you think might be the reason of this pandemic?**						**Total**		**Chi square**	**P value**
		Natural virus		**Manmade virus**		**Fake propaganda**					
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**		
Do you follow the protocols advised by the government?	Yes	74	82.2%	129	87.2%	17	94.4%	220	85.9%	5.077	0.27
	No	4	4.4%	9	6.1%	1	5.6%	14	5.5%		
	May Be	12	13.3%	10	6.8%	0	0.0%	22	8.6%		
Do you wear a mask when in	Always	74	82.2%	135	91.2%	16	88.9%	225	87.9%	10.358	0.11
	Often	7	7.8%	11	7.4%	1	5.6%	19	7.4%		

Continued.

Questions	Responses	Do you think the complete lockdown was effective/necessary in controlling the viral spread?						Total		Chi Square	P value
		Yes		No		May Be					
		N	%	N	%	N	%	N	%		
public?	Sometimes	7	7.8%	2	1.4%	1	5.6%	10	3.9%		
	Never	2	2.2%	0	0.0%	0	0.0%	2	0.8%		
Do you keep ≥ 6 feet distance apart from others?	Always	26	28.9%	39	26.4%	4	22.2%	69	27.0%	7.862	0.24
	Often	16	17.8%	36	24.3%	1	5.6%	53	20.7%		
	Sometimes	37	41.1%	58	39.2%	8	44.4%	103	40.2%		
	Never	11	12.2%	15	10.1%	5	27.8%	31	12.1%		

Majority (>80%) of the study subjects belonging to rural and urban regions followed the protocols advised by the government. Most rural and female subjects in our study (81.9% and 84.6% respectively) used frequent hand washing as a protective measure at home when compared to 74.1% urban and72.2% male study subjects, this difference was statistically significant (p<0.001 and p<0.04 respectively).

More number of urban and female study subjects (53.6% and 59.2% respectively) when compared to the rural and subjects (44.4% & 37.3% respectively) thought that 3 Ply mask is most effective (p<0.007 and p<0.001 respectively). A significantly higher number of female study subjects thought that there can be cross contamination from the disposed mask when compared to males (p<0.01).

Table 4 shows the attitudes, beliefs and behaviors related to COVID-19 based on Age groups. More than 55% of the study subjects below the age of 40 years thought the most effective preventive measure to stop the viral transmission was social distancing while 53.2% of them who were above 41 years of age thought mask was most effective (p<0.05). A significantly higher number of <40 years study subjects thought that there can be cross contamination from the disposed mask when compared to >41 years (p<0.001).

Table 5 shows attitudes, beliefs and behaviors related to COVID-19 based on Level of Education. More than 75% of the graduates and professionals believed that corona virus actually exists, while more than 25% of those who completed only school said they did not believe the virus exists (p<0.001). Interestingly, 81% professionals and 51.6% graduates believed this was a man made virus, however they also believed social distancing was most effective preventive measure (p<0.001 & p<0.002 respectively). Majority of the professionals used hand sanitizers 3-5 times a day, believed 3 ply mask was most effective and that disposed masks could cause cross contamination and always wore a mask in public (p<0.009, p<0.001, p<0.006 and p<0.007 respectively).

Table 6 shows the attitudes, beliefs and behaviors related to COVID-19 based on employment status. Majority of essentially employed subjects believed corona virus actually existed, used hand sanitizer >5 times / day and thought the 3 ply mask is the most effective type of mask (p<0.05).

DISCUSSION

We would like to emphasise that the present study is one of the few studies assessing the beliefs, attitude and practice of the general public in India. This is noteworthy for multiple reasons, our study findings could significantly add to the literature of the perception of the public towards not only COVID-19 but also potentially infectious diseases of the same scale and magnitude of transmission, the level of adherence to preventive and control measures amongst the public and their support to the governmental measures taken to control the spread in the community.

We found that most of the study participants (>65%) believed in the existence of corona virus and 63% supported the complete lockdown and felt it was effective in controlling the viral spread. Other studies asked people if they believed if COVID-19 was a contagious disease, more than 85% of the respondents believed it was contagious.[7-9] In a survey done in USA, higher number of respondents (>80%) said they supported stay-at-home order and nonessential business closures. Another survey done in India, it was reported that 96% subjects supporting the lockdown in India.[6,10] Widespread support for community mitigation strategies and commitment to COVID-19 public health recommendations indicate that protecting health and controlling disease are public priorities amid this pandemic, despite daily-life disruption and adverse economic impacts.[6]

The lower percentage supporting the lockdown in our study may be attributed to the various socio demographic characteristics of our study population. Most of our respondents belonged to rural regions and fell under the non essential employment category, which might have exposed them to a financial uncertainty or instability. These factors could have perhaps driven less percentage of

our study population to not support the complete lockdown.

Interestingly, nearly 58% of our study respondents stated that they believed corona virus to be a man made virus. However, more than 85% stated that they followed the protocols advised by the government. Another study reported that about 26.8% of their study respondents believed the virus is a bio-weapon.[7] Similar to our findings, Czeisler et al reported that >75% of their study subjects would not feel safe if the community strategies were not in place.[6] Likewise, Ferdous et al found that 88% of their surveyed population followed the rules put in place by the government.[11]

Frequent hand washing and social distancing were considered as effective protective and preventive measure respectively by most respondents. Hand washing and social distancing were also selected by majority respondents in several other Indian and International studies.[7,8,10-14] Nearly 87% of the respondents always wore a mask in public, similar findings were reported in several studies.[6,7,12] Usage of face mask in public was higher in a few studies, while results lower than our findings have also been reported.[8,9,13,15]

Despite the number of females who believed in the existence of the virus being higher (p=0.03), they were not certain about whether the virus can be contained by the preventive measures prescribed by the government (p=0.02). Nevertheless, a higher proportion of females followed the protocols set by the government, this was similar to the findings of Ferdous et al.[11] More females when compared to males also considered frequent hand washing to be the most protective measure (p=0.04). These findings are consistent with other studies showing that, in response to infectious diseases, men were significantly less likely take preventive and protective measures than women.[11,13,16-18] Contrasting results were reported by a few studies.[10,12]

While a lower number of rural study subjects believed in the existence of the corona virus when compared to the urban study subjects, we did not find any significant association. A higher number of study subjects in the rural regions thought hand washing was the most effective protective measure (p=0.001). It is important to draw attention to our finding that there was no difference in the practice of preventive strategies between the rural and urban study subjects. However, Czeisler et al found higher percentages of respondents from urban areas reported use of cloth face coverings than did rural area respondents.[6] In an Egyptian survey, it was reported that rural people had a lower practice score as compared to urban people.[7]

In our study, 90.3% of the respondents in rural area claimed that they were always wearing a face mask in public, this is more when compared to the study done by Gupta et al where only 77% of the rural population claimed that they were using face mask in public.[12] This could be because most of our study subjects were either graduates or professionals, this is higher compared to Gupta et al wherein most subjects had only primary education or less.[12]

Our findings showed that the positive belief about corona virus was significantly associated with the high practice of preventive and protective measures. Others have previously reported similar associations when performing KAP surveys toward COVID-19.[19–21] Efficacy beliefs have a significant and robust impact on practicing preventive behaviours towards COVID-19 among the public. Consistent with evidence that efficacy belief serves as significant predictors of preventive behaviours.[22–24]

In our study, there was a significant association between the level of education and the reason for this pandemic, where >75% professionals and graduates believed in the existence of the virus. However, 81% of the professionals and 51% graduates believed this was a man-made virus. Most preventive and protective measures were practiced by most professionals (p=0.001). Previous studies found similar results.[10] The positive association found between the practice and educational background supports the claim of higher awareness and education leads to increased adherence to the preventive strategies. It could also be attributed to the reason that people with higher education get more sensitized by information provided by the government and media.

Periodic assessments of public beliefs, attitudes, and preventive measures would prove useful to inform the policymakers and healthcare professionals, for future planning if subsequent outbreak waves occur and if additional periods of expanded mitigation efforts are necessary to prevent the spread of COVID-19 and save lives. As the pandemic progresses and mitigation strategies evolve, understanding public attitudes, behaviours, and beliefs is critical. Adherence to recommendations to wear a face mask and physical distancing guidelines are of public health importance. Strong public support for these behaviours suggests an opportunity to normalize safe practices and promote continued use of these and other recommended personal protective behaviors to minimize further spread of COVID-19.

Limitations

This study has several limitations. Like other online surveys, this study was limited to the people who had smartphones, e-mail IDs and the ability to read and we used convenience sampling through the networks of the researchers and disseminated the forms through social media platforms. Thus, the majority of the respondents were from the southern part of India. Therefore, further research should be done on a larger sample representative of all regions of the country. The findings of this study should not be generalized to the whole population. This represents a major limitation of this study.

Second, beliefs and adherence to recommendations were self-reported; therefore, responses might be subject to recall and response biases. The restricted number of questions to encourage participation and increase response was another limitation. A further limitation of the present study is the possibility of the participants giving socially desirable responses.

CONCLUSION

In summary, the present study was able to provide a comprehensive representation of the beliefs, attitudes and practices of Indians towards COVID-19. Our findings suggest that the surveyed population has an acceptable level of positive beliefs, attitude, and good practices towards COVID-19. India is currently experiencing its second wave of rise in the corona virus cases; vaccines for COVID-19 have been developed and are being administered in a phased manner across the country. However, serologists and other experts say that despite the vaccine, all protective measures should be followed. In the present scenario, the current study findings along with other similar literature may provide essential data to the policy makers for the reopening policies, the restriction levels of the mitigation strategies and bringing life back to normalcy.

Additionally, we recommend that more emphasis on effective messaging should be placed on people belonging to lower education and income strata. Vulnerable populations who require proper health education and guidance for prevention and control of COVID-19 should be targeted. Pandemics of this magnitude and resulting high death rates call for consistent messaging from the government and/ or health authorities as they are key to aid public knowledge and understanding of COVID-19. This then helps the prevention and control of transmission and subsequent outbreak waves unless the community develops herd immunity.

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