Research Article

ASSESSMENT OF KNOWLEDGE, ATTITUDE & PRACTICE TOWARDS COVID-19 AMONG GENERAL PUBLIC DURING THE GLOBAL HEALTHCARE CRISIS: A WEB BASED CROSS SECTIONAL STUDY

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ABSTRACT

***Background*:** Coronavirus outbreak looms with fear and uncertainty. Public awareness is considered as one of the most important determinants of control and preventive measures of the disease. During this global healthcare crisis, this study aims to assess the determinants of knowledge, attitude and practice towards COVID-19.

***Methodology*:** This online cross-sectional study was conducted by employing a self-administered questionnaire to assess the KAP towards COVID-19 among general public. The time frame for this study was 10th April to 30th April 2020. The survey was conducted through various social media platforms. Descriptive statistical methods were majorly employed to summarize the data on demographic characteristics and responses to questions concerning KAP towards COVID-19. The data was summarized as frequencies and percentages (%) for categorical variables. The Independent sample t-test, one-way ANOVA, chi square test, multiple linear regression analyses, and multinomial/binary logistic regression analysis were also employed. A p value of <0.05 was taken as statistically significant.

Results: A total of 515 participants completed the online survey questionnaire with mean age of 25.1 years ranging from of 18-70 years. Male participants (271) were slightly higher than females (244), a majority of which 450 (87.4%) were unmarried, more than half of them 281 (54.6%) held a masters degree or above, and 351 (68.2%) were students. The overall average COVID-19 knowledge score (SD) was 11.7 (2.121) with 78% (11.7/15*100) correct rate in the knowledge section. The correct response percentage of the 15 questions on the COVID-19 knowledge questionnaire was in the range of 30.48-98.44%. The majority of the respondents agreed that COVID-19 will be successfully controlled and had confidence that India can win this battle, maintaining social distance along with personal hygiene. Most of the participants did not visit any crowded place (93.5%), wore masks before going out (90.6%).

***Conclusions*:** Our findings suggest that Indian adults demonstrated good knowledge, a positive attitude and practice towards COVID-19. However, knowledge was lower among older adults and less educated groups. But lack of specific treatment attracts more coordinated efforts to educate and practice the preventive measures.

Key words: Knowledge, Attitude, Practice, COVID-19, India

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Introduction

Coronavirus disease 2019 (COVID-19) was first reported in Wuhan, Hubei Province, China, in December 2019, and has since then spread globally. On 11 March 2020, the World Health Organization recognized COVID-19 as a pandemic [1]. Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). In order to understand the disease characteristics and outcomes, Huang et al. collected and analysed data from 41 COVID-19 confirmed patients. According to them, many of the early cases identified were linked to the Huanan seafood and animal market in Wuhan as 27 patients had reported market exposure, which

suggests that Middle East Respiratory Syndrome Coronavirus (MERS-CoV) is an emerging zoonotic virus, essentially indicating they are transmitted between animals and people [2]. According to the Centre for Disease and Control Prevention, "229E, NL63, OC43, and HKU1 are the most common human Coronaviruses out of the seven viruses identified" [3].

COVID-19 is reported to be highly infectious; and, its main clinical symptoms include fever, which is the most common symptom, dry cough, fatigue, malaise, and shortness of breath. Global concerns about the virus have risen due to its high transmission capability, which may be coupled with morbidity and mortality [2]. The elderly patients, due to the comorbidities, are reported to be more likely to be infected. Moreover, they are more prone to serious complications, which may be associated with acute respiratory distress syndrome (ARDS) and the cytokine storm [4].

On January 30, 2020, the WHO declared the novel Coronavirus outbreak (2019-nCoV) a Public Health Emergency of International Concern (PHEIC) and also stressed on more coordinative and collaborative efforts of all countries to prevent the progression of this pandemic [5].

As of 30th April 2020, the number of new cases is growing at a rapid pace globally, with a total number of 3,090,445 laboratory-confirmed cases and 217,769 associated deaths reported by World Health Organization. A total of 1,001,968 cases have recovered [6]. The number of laboratory confirmed cases in the South-East Asian Region is 54,021 and associated deaths reports are 2088[6].

India, under lockdown for the past 40 days has 33,050 laboratory-confirmed cases, and 1074 deaths have been reported by World Health Organization, and 8437 cases have been recovered, 23,546 cases are still active [6]. As of 30th April 2020, the Case Fatality Rate (CFR) - percent of cases that result in death in India is 3.24% which is quite lower as compared to China (5.50%) and U.S.A (5.22%) [6].

The situation is changing rapidly as its pandemic nature has created sense of fear and uncertainty in general public. The developing countries, with inadequate healthcare delivery systems, at the verge of a sever public healthcare crisis. There is no specific treatment for this disease, so healthcare providers treat the clinical symptoms (e.g. fever, difficulty in breathing) of patients. Apart from treating clinical symptoms, entirely new approaches have been adopted to control the rapid progression of this ongoing COVID-19 epidemic across the globe.

This study aimed to assess the determinants of knowledge, attitude and practice (KAP) towards COVID-19.

Methodology

Study design

This was a cross-sectional online survey. The survey was conducted by employing a self-administered questionnaire to assess the KAP towards COVID-19 among general public. The questionnaire consisted of a total 23 questions pertaining to knowledge, attitude and practice towards COVID-19. The complete survey took 4 minutes to read and answer.

Table 1. Demographic characteristics of participants and knowledge score of COVID-19 by demographic variables

Characteristics	Number of participants (%)	Knowledge score (mean ± standard deviation)	t/F	P
Gender				
Male	271 (52.6)	11.89 ± 2.10	-	-
Female	244 (47.4)	11.49 ± 2.12	2.133	0.033
Age-groups (years)				
18-29	457 (88.7)	11.82 ± 1.84	-	-
30-49	47 (9.1)	11.70 ± 1.74	-	-
50+	11 (2.1)	6.73 ± 5.81	35.001	<0.001
Marital status				
Married	65 (12.6)	10.65 ± 3.42	-	-
Unmarried	450 (87.4)	11.85 ± 1.81	-4.347	<0.001
Education				
Middle school & below	2 (0.4)	11.0 ± 0.00	-	-
High school and intermediate	20 (3.9)	9.40 ± 4.46	-	-
Bachelor's degree	210 (40.8)	11.46 ± 2.29	-	-
Master's degree & above	281 (54.6)	12.09 ± 1.38	-	-
Uneducated	2 (0.4)	5.50 ± 7.77	14.664	<0.001
Occupation				
Government employee	22 (4.3)	11.09 ± 3.33	-	-
Private employee	117 (22.7)	11.63 ± 2.02	-	-
Student	351 (68.2)	11.87 ± 1.80	-	-
Physical labour/Unemployed	25 (4.9)	10.08 ± 3.96	6.472	<0.001
Overall	515 (100.0)	11.70 ± 2.12	-	-

Table 2. Knowledge of participants on COVID-19 (n=515)

Knowledge Questions	Correct response		Incorrect Response (includes both wrong and I don't know response)	
	N	%	n	%
K1	496	96.31	19	3.68
K2	282	54.75	233	45.24
K3	486	94.36	29	5.63
K4	407	79.02	108	20.97
K5	289	56.11	226	43.88
K6	424	82.33	91	17.66
K7	485	94.17	30	5.82
K8	394	76.50	121	23.49
K9	435	84.46	80	15.53
K10	507	98.44	8	1.55
K11	505	98.05	10	1.94
K12	157	30.48	358	69.51
K13	494	95.92	21	4.07
K15	449	87.18	66	12.81
K15	214	41.55	301	58.44

Table 3. Results of multiple linear regression on factors associated withCOVID-19 knowledge score

Variable	Coefficient	Standard error	t	P
Gender (Male vs Female)	0.398	0.187	2.133	0.033
Age groups (18-29 vs 50+)	5.089	0.608	8.367	<0.001
Age groups (30-49 vs 50+)	4.975	0.668	7.451	<0.001
Marital status (Unmarried vs Married)	1.203	0.277	4.347	<0.001
Education (High school & intermediate vs master's degree & above)	-2.689	0.467	-5.761	<0.001
Education (Bachelor's degree vs master's degree and above)	-0.632	0.184	-3.435	<0.001
Education (Uneducated vs master's degree and above)	-6.589	1.431	-4.604	<0.001
Occupation (Physical labour/unemployed vs Private employee)	-1.552	0.460	-3.374	<0.001
Occupation (Physical labour/unemployed vs Student)	-1.792	0.432	-4.145	<0.001

Data collection

The study was conducted from 10th April -30th April 2020 among Indian adults. The data collection was done through various electronic platforms, owing to the nationwide lockdown. The questionnaire included an introduction regarding the objectives, choice of participation, declarations of confidentiality and anonymity. The inclusion criteria included Indian nationality, age of 18 years and above, and willingness to participate in the survey.

Measures

The questionnaire consisted of four sections: questions pertaining to demographics (included age, gender, marital status, education and occupation), knowledge, attitudes and practice towards COVID-19. The knowledge section consisted of 15 multiple-choice questions which could be answered as "true", "false" or "I don't know". Every correct answer was assigned 1 mark and an incorrect or unknown answer was assigned 0 marks. The total knowledge score ranged from 0 to 15, with a higher score denoting a better knowledge of COVID-19 and vice-versa.

The attitudes section consisted of 4 multiple-choice questions which could be answered as "agree", "disagree" or "I don't know". Likewise, the practices section consisted of 4 questions which could be answered as "Yes" or "false".

All the responses were recorded and coded accordingly later on. Final data were used to assess internal consistency reliability using Cronbach's coefficient. The value of Cronbach's alpha coefficient for the knowledge questionnaire was 0.752 in our study, which is well above the acceptable threshold for internal consistency [7]. The overall average COVID-19 knowledge score, were computed based upon the data received.

Statistical analysis

Descriptive statistical methods were majorly employed to summarize the data on demographic characteristics and responses to questions concerning KAP towards COVID-19. The data was summarized as frequencies (n) and percentages (%) for categorical variables. Knowledge on COVID-19 was assessed by calculating total cumulative knowledge score for each participant. Knowledge scores and attitudes along with practices of the participants were compared using statistical tests like Independent samples t=test, one-way ANOVA, or Chi-square test according to the different demographic characteristics. Multiple linear regression analysis using all the demographic variables as independent variables and knowledge score as the outcome variable was conducted to identify factors associated with knowledge. Multinomial logistic regression analyses were used to identify factors associated with attitudes. Unstandardized regression coefficients (β) and their 95% confidence intervals (CIs) were used to quantify the associations between variables and attitudes. Similarly, binary logistic regression analyses were used to identify factors associated with practices. Odds ratios (ORs) and their 95% confidence intervals (CIs) were used to quantify the associations between variables and practices. Factors were selected with a backward selection procedure in a stepwise regression analysis. Data analyses were performed using SPSS (Statistical package for social sciences) version 25.0. $P<0.05$ was considered as "statistically significant".

Results

Demographic information

A total of 515 participants completed the online survey questionnaire. Participants included 271

Table 4. Attitudes towards COVID-19 by demographic variables (n=515)

Characteristics	Attitudes, n (%) or mean (standard deviation)											
	A1			A2			A3			A4		
	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know	Agree	Disagree	I don't know
Gender	-	-	-	-	-	-	-	-	-	-	-	-
Male	241 (88.9%)	12 (4.4%)	18 (6.6%)	263 (97.0%)	1 (0.4%)	7 (2.6%)	260 (95.9%)	4 (1.5%)	7 (2.6%)	255 (94.1%)	7 (2.6%)	9 (3.3%)
Female	225 (92.2%)	4 (1.6%)	15 (6.1%)	242 (99.2%)	1 (0.4%)	1 (0.4%)	233 (95.5%)	2 (0.8%)	9 (3.7%)	236 (96.7%)	7 (2.9%)	1 (0.4%)
Age-groups (years)	-	-	-	-	-	-	-	-	-	-	-	-
18-29	416 (91.0%)	14 (3.1%)	27 (5.9%)	448 (98.0%)	2 (0.4%)	7 (1.5%)	439 (96.1%)	6 (1.3%)	12 (2.6%)	435 (95.2%)	13 (2.8%)	9 (2.0%)
30-49	43 (91.5%)	1 (2.1%)	3 (6.4%)	47 (100.0%)	0 (0.0%)	0 (0.0%)	45 (95.7%)	0 (0.0%)	2 (4.3%)	45 (95.7%)	1 (2.1%)	1 (2.1%)
50+	7 (63.6%)	1 (9.1%)	3 (27.3%)	10 (90.9%)	0 (0.0%)	1 (9.1%)	9 (81.8%)	0 (0.0%)	2 (18.2%)	11 (100.0%)	0 (0.0%)	0 (0.0%)
Marital status	-	-	-	-	-	-	-	-	-	-	-	-
Married	58 (89.2%)	2 (3.1%)	5 (7.7%)	63 (96.9%)	0 (0.0%)	2 (3.1%)	61 (93.8%)	1 (1.5%)	3 (4.6%)	60 (92.3%)	2 (3.1%)	3 (4.6%)
Unmarried	408 (90.7%)	14 (3.1%)	28 (6.2%)	442 (98.2%)	2 (0.4%)	6 (1.3%)	432 (96.0%)	5 (1.1%)	13 (2.9%)	431 (95.8%)	12 (2.7%)	7 (1.6%)
Education	-	-	-	-	-	-	-	-	-	-	-	-
Middle school and below	2 (100.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)	0 (0.0%)
High school and intermediate	18 (90.0%)	0 (0.0%)	2 (10.0%)	17 (85.0%)	2 (10.0%)	1 (5.0%)	17 (85.0%)	2 (10.0%)	1 (5.0%)	16 (80.0%)	4 (20.0%)	0 (0.0%)
Bachelor's degree	186 (88.6%)	4 (1.9%)	20 (9.5%)	206 (98.1%)	0 (0.0%)	4 (1.9%)	198 (94.3%)	4 (1.9%)	8 (3.8%)	198 (94.3%)	4 (1.9%)	8 (3.8%)
Master's degree and above	259 (92.2%)	12 (4.3%)	10 (3.6%)	278 (98.9%)	0 (0.0%)	3 (1.1%)	275 (97.9%)	0 (0.0%)	6 (2.1%)	273 (97.2%)	6 (2.1%)	2 (0.7%)
Uneducated	1 (50.0%)	0 (0.0%)	1 (50.0%)	2 (100.0%)	0 (0.0%)	0 (0.0%)	1 (50.0%)	0 (0.0%)	1 (50.0%)	2 (100.0%)	0 (0.0%)	0 (0.0%)
Occupation	-	-	-	-	-	-	-	-	-	-	-	-
Government employee	19 (86.4%)	2 (9.1%)	1 (4.5%)	22 (100.0%)	0 (0.0%)	0 (0.0%)	21 (95.5%)	0 (0.0%)	1 (4.5%)	22 (100.0%)	0 (0.0%)	0 (0.0%)
Private employee	110 (94.0%)	4 (3.4%)	3 (2.6%)	116 (99.1%)	0 (0.0%)	1 (0.9%)	115 (98.3%)	2 (1.7%)	0 (0.0%)	110 (94.0%)	3 (2.6%)	4 (3.4%)
Student	315 (89.7%)	10 (2.8%)	26 (7.4%)	345 (98.3%)	0 (0.0%)	6 (1.7%)	334 (95.2%)	4 (1.1%)	13 (3.7%)	337 (96.0%)	8 (2.3%)	6 (1.7%)
Physical labour/unemployed	22 (88.0%)	0 (0.0%)	3 (12.0%)	22 (88.0%)	2 (8.0%)	1 (4.0%)	23 (92.0%)	0 (0.0%)	2 (8.0%)	22 (88.0%)	3 (12.0%)	0 (0.0%)
COVID-19 Knowledge score	11.75 (1.8)	12.31 (2.1)	10.64 (4.0)	11.80 (1.9)	4.00 (0.0)	7.13 (4.4)	11.79 (1.9)	11.50 (2.4)	8.81 (4.5)	11.82 (1.9)	10.29 (2.9)	7.70 (4.4)
Overall	466 (90.4%)	16 (3.1%)	33 (6.4%)	505 (98.0%)	2 (0.3%)	8 (1.5%)	493 (95.7%)	6 (1.1%)	16 (3.1%)	491 (95.3%)	14 (2.7%)	10 (1.9%)

Table 5. Results of multinomial logistic regression analysis on factors significantly associated with attitudes towards COVID-19

Variable	OR (95% CI)	P
A1: Unknown about final success in controlling COVID-19 and confidence of winning (vs agree)	-	-
Age-group (18-29 vs 50+)	0.15 (0.03, 0.61)	0.009
Age-group (30-49 vs 50+)	0.16 (0.02, 0.97)	0.047
COVID-19 Knowledge score	0.84 (0.75, 0.95)	0.006
A2: Disagreement on best practices for protection from COVID-19 (vs agree)	-	-
COVID-19 Knowledge score	0.59 (0.44, 0.80)	<0.001
A2: Unknown about best practices for protection from COVID-19 (vs agree)	-	-
COVID-19 Knowledge score	0.67 (0.57, 0.79)	<0.001
A3: Unknown about best sources of COVID-19 information available (vs agree)	-	-
Age-group (18-29 vs 50+)	0.12 (0.02, 0.63)	0.012
Education (Bachelor's degree vs Uneducated)	0.04 (0.00, 0.70)	0.028
Education (Master's degree and above vs Uneducated)	0.02 (0.00, 0.39)	0.009
COVID-19 Knowledge score	0.73 (0.64, 0.83)	<0.001
A4: Disagree about lying to pass routine screening (vs agree)	-	-
Occupation (Student vs Physical labour/unemployed)	0.17 (0.04, 0.70)	0.014
COVID-19 Knowledge score	0.79 (0.67, 0.93)	0.006
A4: Unknown about lying to pass routine screening (vs agree)	-	-
Gender (Male vs Female)	8.32 (1.04, 66.24)	0.045
COVID-19 Knowledge score	0.68 (0.59, 0.80)	<0.001

Table 6. Practices towards COVID-19 by demographic variables (n=515)

Characteristics		Attitudes, n (%) or mean (standard deviation)							
		P1		P2		P3		P4	
		Yes	No	Yes	No	Yes	No	Yes	No
Gender	Male	18 (6.6%)	253 (93.4%)	239 (88.2%)	32 (11.8%)	262 (96.7%)	9 (3.3%)	89 (32.8%)	182 (67.2%)
	Female	15 (6.1%)	229 (93.9%)	228 (93.4%)	16 (6.6%)	236 (96.7%)	8 (3.3%)	159 (65.2%)	85 (34.8%)
Age-groups (years)	18-29	23 (5.0%)	434 (95.0%)	413 (90.4%)	44 (9.6%)	441 (96.5%)	16 (3.5%)	222 (48.6%)	235 (51.4%)
	30-49	4 (8.5%)	43 (91.5%)	43 (91.5%)	4 (8.5%)	46 (97.9%)	1 (2.1%)	21 (44.7%)	26 (55.3%)
	50+	6 (54.5%)	5 (45.5%)	11 (100.0%)	0 (0.0%)	11 (100.0%)	0 (0.0%)	5 (45.5%)	6 (54.5%)
Marital status	Married	12 (18.5%)	53 (81.5%)	63 (96.9%)	2 (3.1%)	64 (98.5%)	1 (1.5%)	33 (50.8%)	32 (49.2%)
	Unmarried	21 (4.7%)	429 (95.3%)	404 (89.8%)	46 (10.2%)	434 (96.4%)	16 (3.6%)	215 (47.8%)	235 (52.2%)
Education	Middle school and below	1 (50.0%)	1 (50.0%)	2 (100.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)
	High school and intermediate	5 (25.0%)	15 (75.0%)	19 (95.0%)	1 (5.0%)	18 (90.0%)	2 (10.0%)	8 (40.0%)	12 (60.0%)
	Bachelor's degree	13 (6.2%)	197 (93.8%)	194 (92.4%)	16 (7.6%)	204 (97.1%)	6 (2.9%)	103 (49.0%)	107 (51.0%)
	Master's degree and above	13 (4.6%)	268 (95.4%)	250 (89.0%)	31 (11.0%)	272 (96.8%)	9 (3.2%)	134 (47.7%)	147 (52.3%)
	Uneducated	1 (50.0%)	1 (50.0%)	2 (100.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)	1 (50.0%)	1 (50.0%)
Occupation	Government employee	4 (18.2%)	18 (81.8%)	21 (95.5%)	1 (4.5%)	22 (100.0%)	0 (0.0%)	9 (40.9%)	13 (59.1%)
	Private employee	10 (8.5%)	107 (91.5%)	109 (93.2%)	8 (6.8%)	114 (97.4%)	3 (2.6%)	58 (49.6%)	59 (50.4%)
	Student	15 (4.3%)	336 (95.7%)	312 (88.9%)	39 (11.1%)	339 (96.6%)	12 (3.4%)	169 (48.1%)	182 (51.9%)
	Physical labour/unemployed	4 (16.0%)	21 (84.0%)	25 (100.0%)	0 (0.0%)	23 (92.0%)	2 (8.0%)	12 (48.0%)	13 (52.0%)
COVID-19 Knowledge score		9.67 (3.4)	11.84 (1.9)	11.69 (2.1)	11.79 (1.5)	11.71 (2.0)	11.18 (2.9)	11.45 (2.2)	11.93 (1.9)
Overall		33 (6.4%)	482 (93.5%)	467 (90.6%)	48 (9.3%)	498 (96.6%)	17 (3.3%)	248 (48.1%)	267 (51.8%)

(52.6%) men and 244 (47.4) women (52.6% & 47.4%). A majority of participants were unmarried (450); more than half of them 281 (54.6%) held a master's degree or above, and 351 (68.2%) were students. Other demographic characteristics of participants along with mean knowledge score are shown in **Table 1** in detail.

The participants had a mean age of 25.1 years (standard deviation, SD=6.36) and a range of 18-70 years.

Knowledge of COVID-19

The overall average COVID-19 knowledge score (SD) was 11.7 (2.121) with 78% (11.7/15*100) correct rate in the knowledge section. The correct response percentage of the 15 questions on the COVID-19 knowledge questionnaire was in the range of 30-98% (**Table 2**). Knowledge scores significantly differed across age-groups, categories of marital status, education levels, and occupation type (P<0.001). Multiple linear regression analysis showed that male gender (vs. female) [β: 0.398, P=0.033], age-group of 18-29 years (vs. 50+ years) [β: 5.089, P<0.001] and age-group of 30-49 years (vs. 50+ years) [β: 4.975, P<0.001] were significantly associated with higher knowledge score. It also showed that high school and intermediate education (vs. master's degree and above) [β: -2.689, P<0.001], bachelor's degree education (vs. master's degree and above) [β: -0.632, P<0.001] and physical labour/unemployed occupation (vs. students) [β: -1.792, P<0.001] were significantly associated with lower knowledge score (**Table 3**).

Attitude towards COVID-19

The majority of the respondents agreed that COVID-19 will be successfully controlled and had confidence that India can win this battle, maintaining social distance along with personal hygiene are the best possible ways of protection from COVID-19, healthcare professionals and official guidelines are the best sources of information regarding COVID-19 and that we should not elude from routine screening at airports along with lying about our travel history with 90.4%, 98.0%, 95.7% and 95.3%, respectively. It was also noted that participants reporting the answer "I don't know" had significantly poorer knowledge scores than those reporting "agree" for the attitudes section (**Table 4**).

Multinomial logistic regression analysis found that age-group 18-29 years (vs. 50+ years) [OR: 0.15, P=0.009], age-group 30-49 years (vs. 50+ years) [OR: 0.16, P=0.047] and COVID-19 knowledge score [OR: 0.84, P=0.006] were significantly associated with the answer "I don't know" for the attitudes question A1. COVID-19 knowledge score [OR: 0.59, P<0.001] was also significantly associated with disagreement about the best practices for protection from COVID-19 (Table 6). Age-group 18-29 years (vs. 50+ years) [OR: 0.12, P=0.012], bachelor's degree education (vs. uneducated) [OR: 0.04, P=0.028], master's degree and above education (vs. uneducated) [OR: 0.02, P=0.009] and COVID-19 knowledge score [OR: 0.73, P<0.001] were significantly associated with the answer "I don't know" for the attitudes question A3. Student occupation (vs. physical

labour/unemployed) [OR: 0.17, P=0.014]and COVID-19 knowledge score [OR: 0.73, P<0.001] were significantly associated with disagreement about lying to pass routing screening at airports and bus stands. Whereas gender male (vs. female) [OR: 8.32, P=0.045]and COVID-19 knowledge score [OR: 0.68, P<0.001] were significantly associated with the answer "I don't know" for the attitudes question A4 (**Table 5**).

Practice towards COVID-19

Most of the participants did not visit any crowded place (93.5%), wore masks before going out (90.6%), and started washing hands more often (96.6%) in recent times. While almost half of the participants applied cream on hands (48.1%). (**Table 6**).

Binary logistic regression analysis showed that marital status married (vs. unmarried) [OR: 0.22, P<0.001], age-group 18-29 years (vs. 50+ years) [OR: 22.64, P<0.001], age-group 30-49 years (vs. 50+ years) [OR: 12.90, P<0.001], student occupation (vs. physical labour/unemployed) [OR: 4.26, P=0.017], and COVID-19 knowledge score [OR: 1.32, P<0.001] were significantly associated with not going to any crowded place. Male gender (vs. female) [OR: 1.90, P=0.043] was significantly associated with not wearing a mask outside. While male gender (vs. female) [OR: 3.82, P<0.001], and COVID-19 knowledge score [OR: 1.11, P<0.013] were significantly associated with not applying cream on hands (**Table 7**).

Discussion

COVID-19 disease was flagged as a pandemic by the World Health Organization (WHO) on 11th March 2020 [1]. And it was Wuhan, capital of central China's Hubei province where the disease was first identified during the outbreak of severe acute respiratory syndrome (SARS) [8]. India is one of the biggest countries in the South Asian region and is the second most populous country in the world after China with more than 1.3billion citizens. This high number attracts a great possibility of community spread and high risk of mortality, especially among elderly and those with chronic diseases. Global as well as national level efforts have been brought into action to prevent the spread of the disease. Governments are putting their best efforts in educating the general public, bringing optimistic attitude and adopting preventive practices towards the virus.

Based on our findings, the KAP towards COVID-19 score was significantly higher among younger population (18-29 years), unmarried people, students and those who had higher level of education.

Knowledge about the clinical presentation, transmission routes, prevention and control of the disease

We found an overall correct rate of 78% on the knowledge questionnaire which indicates above average knowledge about COVID-19 among the participants. However, our results were lower than those demonstrated by a previous study regarding the KAP towards COVID-19 in China which showed an overall correct rate of 90% knowledge

Table 7. Results of binary logistic regression analysis on factors significantly associated with practices towards COVID-19

Variable	OR (95% CI)	P
P1: Not going to a crowded place	-	-
Marital Status (Married vs Unmarried)	0.22 (0.10, 0.46)	<0.001
Age-group (18-29 vs 50+)	22.64 (6.43, 79.72)	<0.001
Age-group (30-49 vs 50+)	12.90 (2.68, 61.87)	<0.001
Occupation (Student vs Physical labour/unemployed)	4.26 (1.30, 13.99)	0.017
COVID-10 Knowledge score	1.32 (1.18, 1.49)	<0.001
P2: Not wearing a mask outside	-	-
Gender (Male vs Female)	1.90 (1.01, 3.57)	0.043
P4: Not applying cream on hands	-	-
Gender (Male vs Female)	3.82 (2.65, 5.51)	<0.001
COVID-10 Knowledge score	1.11 (1.02, 1.21)	0.013

among the Chinese [9]. The lower correct rate regarding knowledge about COVID-19 among Indian adults could be the result of less exposure to the information provided by the government authorities and media about the virus. Furthermore, our study found that higher knowledge score regarding COVID-19 was not significantly associated with a higher likelihood of having positive attitude and good practice at the time of COVID-19 pandemic. This result deviates from the fact that improving general population's knowledge regarding COVID-19 would enhance their attitude and practice towards COVID-19. In our study, the mean knowledge score was significantly lower among older participants and people with lower educational levels. Our results are important since they may point out on putting more efforts to aware these categories, which may have difficulties understanding the information provided.

Attitude towards the COVID-19

In our study, the majority of the participants held an optimistic attitude towards the COVID-19 pandemic as 90.4% believed that COVID-19 will finally be successfully controlled and had confidence that India can win the battle against the virus. The optimistic attitude of the Indian

adults could be related to the stringent COVID-19 control measures taken by the government such as complete nation-wide lockdown which enhance people's confidence in winning the battle against the virus. Moreover, the good knowledge about COVID-19 among the Indian adults can also explain this phenomenon, because as shown by results, higher COVID scores were significantly associated with less likelihood of "disagree" and "I don't know" answers to questions A2, A3 and A4. Participants also showed a positive attitude towards measures that can be followed to prevent the transmission of the disease. They believed in the value of hand washing, maintaining social distance, covering face while sneezing and coughing, following only trusted sources for information regarding COVID-19. Further efforts and encouragement is required from the government for metamorphosing these well-adjusted attitudes into reasonable practices.

Practice towards the COVID-19

The practices of Indian adults were very cautious: majority of the participants avoided crowded places (93.5%), wore masks when leaving the home (90.6%) and starting washing hands more often (96.6%) during the outbreak of COVID-19. These strict preventive practices could be primarily attributed to the very strict prevention and control measures implemented by the Indian governments such as banning public gatherings, compulsion of wearing masks while going outside. Unfortunately, the present study still showed that 6.4% residents went to crowded places and 9.3% did not wear masks when leaving homes.

An astonishing 90.6% of the participants wore a face mask before going out. In contrast, almost all participants in a Chinese study used to put face masks when they go out during the current pandemic [9]. Centres for Disease Control and Prevention (CDC) recommends putting cloth face coverings for the public, especially in areas where there is significant community-based transmission [10]. While, WHO recommends using face masks only if a person has respiratory symptoms or caring for another person with symptoms [11]. As there is no clear agreements on the rationale of using face masks in public places to prevent the spread of COVID-19 [12]. Governments and public health policy makers should develop guidelines on this issue to control the irrational use of surgical masks during the current pandemic time.

The study analysed the characteristics of KAP towards COVID-19 and identified some demographic factors associated with it. These findings could be useful for the official authorities and health workers to recognize sections of the society which need more attention for COVID-19 prevention and health education. Limited access to internet and online health information resources could be the contributors for poor knowledge, negative attitudes, and inappropriate preventive practices towards COVID-19 in the vulnerable populations of Indian society such as elderly, poorly educated people and rural people at grass-root level. Therefore, KAP towards COVID-19 of vulnerable populations deserves special research attention in today's India.

Conclusions

To conclude, our findings suggest that Indian adults demonstrated good knowledge, a positive attitude, and reasonable practice regarding COVID-19 during the outbreak which is important to limit the spread of the disease. However, knowledge was lower among older adults and less educated groups. In the absence of specific treatment for a particular disease, public awareness is considered as an important determinant in order to halt the progression. By increasing knowledge via different means by the Indian authorities and the cooperation by the general population, timely control and elimination of the disease can be anticipated. Although the government has taken optimum steps to limit the spread of the disease within the country, more efforts are needed to support the most affected sections of the society from the economic consequence of the disease.

Limitations of the study

Acknowledging the limitations of this study, more studies are needed in near future to investigate the KAP towards COVID-19 among the Indian adults.

This online study had the limitation of capturing the responses from participants who could read English language and had access to internet. Another major limitation of this study is its low sample size.

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Compliance with Ethical Standards

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***Informed Consent*:** Participation was purely voluntarily. Informed consent was obtained from all individual participants included in the study.

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