

# KNOWLEDGE, ATTITUDE, AWARENESS AND PRACTICE TOWARDS COVID-19 PANDEMIC IN INDIAN CITIZENS DURING THE NATIONAL LOCKDOWN PERIOD: A QUICK ONLINE CROSS-SECTIONAL STUDY

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## ABSTRACT

COVID-19 pandemic is causing unprecedented human health and economic consequences all across the globe. Being an international health emergency, the current state of global and national preparedness is at peak. The cases in India are increasing every day in spite of substantial efforts and control measures by the health authorities. Indian citizen's knowledge, attitude, awareness, and practice influence their adherence towards COVID-19 control measures. This online study was conducted among Indian citizens KAAP towards COVID 19 during the national lockdown period. An online KAAP questionnaire was shared with four regional coordinators and it was shared with many citizens through online platforms in their regions. There were a total of 16 questionnaires in the KAAP online format. Among the survey respondents (n=12091), 57.9% were females, 51% hold an undergraduate degree, and 63.06% were from urban locality. The majority of the respondents (87.2%) had confidence that India will win the battle against the COVID-19 pandemic health crisis. Also the majority of respondents (86.5%) have adequate knowledge about the COVID-19. The COVID-19 knowledge scores were significantly lower in persons without the confidence of winning (P<0.001). In multiple logistic regression analysis showed that COVID-19 knowledge score (OR: 0.69, P<0.0001) were significantly associated with negative attitudes and preventive practices towards COVID-2019 with no confidence of winning. Most of the Indian citizens with an undergraduate degree, particularly females, have adequate knowledge about the COVID-19 pandemic, and they hold optimistic attitudes and follow appropriate practice towards COVID-19. More targeted and focused health guidelines meeting the various segments of the Indian population should be provided at improving COVID-19 knowledge, which will improve their optimistic attitude. Due to fewer respondents, the results should not be generalized to the entire population.

**KEY WORDS:** Knowledge, Attitude, Awareness, Practice, Covid-19, India, National lockdown period.

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## INTRODUCTION

Coronavirus disease 2019 (abbreviated as COVID-19) was first identified following an outbreak of pneumoni-like symptoms in the city of Wuhan, Hubei Province of China in December 2019. It was notified to China World Health Organization (WHO) country office on 31<sup>st</sup> December 2019. The new novel strain of coronavirus (2019-nCoV) was detected by Chinese Health authorities on 07<sup>th</sup> January 2020 [1] Initially named 2019 nCoV, the virus was from the same family as the agents that caused previous severe respiratory illness outbreaks: SARS in Asia in 2002 and MERS in the Middle East in 2012.

The COVID-19 epidemicspreadveryquickly to other countries from China, and by February 15,2020,the virus had reached 26 countries altogether, resulting in 51,857 laboratory-confirmed infections and 1669 deaths. The World Health Organization (WHO) declared it a public health emergency of international concern on January 30 and called for collaborative efforts of all countries to prevent the rapid spread of COVID-19.

In response to this serious situation of COVID-19 spread, the World Health Organization (WHO) on 11<sup>th</sup> March 2020 declared COVID-19 a pandemic, pointing to the over 118,000 cases of the coronavirus illness in over 110 countries and territories around the world and the sustained risk of further global spread.The devastationeffects of COVID 19 are being felt in all the countries and unfortunately there are no proven medicines to cure or modify the course of the disease, nor a vaccine to control its spread. The transmission of the infectious disease and its time-course is alarming, and it is very evident that this pandemic will continue into the foreseeable future [2].

Globally 3,595,662 COVID-19 cases have been reported with 247,652 deaths reported across 210 countries as on 07<sup>th</sup> May 2020 [3]. According to the Government of India and Ministry of Health and Family Welfare data, the COVID-19 active cases in the Indian sub-continent as of today (07<sup>th</sup> May 2020) is 35,902 active cases and the fatality is 1783 deaths. As the world fights with the public health emergency, and economic

crisis from the COVID-19 pandemic, developing countries like India become the most vulnerable to its profound negative impact [4].

COVID- 19 is highly infectious, and its main clinical symptoms include fever, dry cough, fatigue, myalgia, and dyspnea [5]. Patients with co-morbid conditions develop to the severe stage, which is characterized by acute respiratory distress syndrome, septic shock, difficult-to-tackle metabolic acidosis, and bleeding and coagulation dysfunction [6].

The Case Fatality Rate (CFR) of COVID-19 differs by location and has modulated during the early period of the outbreak. This means that the CFR can vary over time and that it can differ by location and by the characteristics of the infected population (age, gender, pre-morbid conditions).

Most individuals with COVID-19 show mild symptoms or asymptomatic. To contain COVID-19's spread and keep infections at a control, many countries across the globe have instituted lockdowns and social distancing. In India, a nation-wide 21-day lockdown was announced with effect from 25 March 2020 to 14 April 2020. Later the second phase of lockdown was continued from 15 April 2020 to 03 May 2020. With cases spiking up all across the country, the third phase of national lockdown was extended from 04 May 2020 to 17 May 2020.

Further, this lockdown is expectedto prevent the sudden and uncontrollable surge in the number of infections in the short term. Additionally, interventions such as social distancing and isolation of infected individuals over several months can reduce the transmission of infections. Interventions such as frequent hand washing, reduced mass gatherings, contact tracing, and quarantines could slow transmission and reduce overall infections [7].

The entire Indian sub-continent has been seriously hit by the COVID-19 pandemic. Some unprecedented measures have been adopted to control the COVID-19 transmission in India. The infection and mortality rate of the disease have forced governments to implement a wave of public health measures in India. Depending on the context, these range from the implementation of People (Janatha) Curfew, three phases

of National Lock-down, Standard Operating Procedures for essential services, and strict hygienic protocols that cause major disruptions in citizens' daily lives. The success of these crucial public health measures rests on the public's willingness to comply with these guidelines and protocols [8]. This study aims in assessing the Knowledge, Attitude, Awareness, and Practice about COVID-19 among Indian citizens and their perception about halting the COVID-19 pandemic curve by cooperating with the government and abiding by their health protocols and policies strictly.

The raging battle against COVID-19 is ongoing still in India. The final success depends on the people's adherence to these COVID-19 control and preventive measures, which is largely affected by their knowledge, attitudes, awareness, and practices (KAAP) towards COVID-19 in accordance with KAAP theory [9,10].

The previous lessons from the SARS outbreak in 2003 suggest that knowledge and attitudes towards infectious diseases are associated with the level of panic emotion among the population, which can also further complicate to prevent the spread of the disease [11,12]. To facilitate the outbreak management of COVID-19 in India, there is an urgent need to understand the public's awareness of COVID-19 at this critical moment in combating the pandemic. In this study, we investigated the KAAP towards COVID-19 of Indian Citizens during the rapid rise period of the COVID-19 outbreak.

## METHODS

**Participants:** This cross-sectional survey was conducted from 05<sup>th</sup> April to 20<sup>th</sup> April 2020, during the national lockdown period. Because it was not feasible to do a community-based national sampling survey during this lockdown period, we decided to collect the data online. Relying on the authors' nationwide networks, an online Google questionnaire link was created and it was posted, reposted, shared, tagged in all possible online social media platforms like WhatsApp, Facebook, Instagram and Twitter accounts. Further, to evoke more responses, four regional coordinators were identified in North, South, East, and Western regions of India by

mentioning the clear objectives of the study to them. And they are included in the study as Co-authors. This method gave a positive response to the survey as the regional coordinators / co-authors shared the survey link to the maximum number of people in their state and neighboring states. The same questionnaire was also e-mailed to many institution heads / industry heads with a request to share this among their students / parents and employees network group respectively. The questionnaire consisted of a brief introduction to the background, objective, procedures, voluntary nature of participation, declarations of anonymity and confidentiality, and notes for filling in the questionnaire, as well as the link and quick response (QR) code of the online questionnaire. Indian citizens with age 16 years and above, who understood the content of the questionnaire, agreed to participate in the study were instructed to complete the questionnaire via clicking the link or scanning the QR code. Although the questionnaire was distributed by networking co-authors.

The Ethics Committee of Navodaya College of Physiotherapy, Raichur approved our study protocol and procedures of informed consent before the formal survey. The questionnaire consisted of two parts: demographics and KAAP. Demographic variables included age, gender, marital status, education, occupation, place of current residence, type of locality, state, and country of residence. The COVID -19 KAAP questionnaires were developed by the authors by adapting to an online survey study conducted by Bao-Ling et al in Wuhan, China [13].

The questionnaire had 16 questions (Table 1): 07 questions for assessing the Knowledge about COVID -19 in which K1 – K4 is regarding clinical presentations and K5- K7 is regarding transmission routes. 03 questions for COVID -19 awareness by AW1 – AW3, 02 questions for attitude towards COVID-19 by AT1 – AT2 and 04 regarding their practices about prevention and control of COVID-19 by P1 – P4. These questions were answered on a true/false basis or yes / no with an additional "I don't know" option. A correct answer was assigned 1 point and an incorrect/ unknown answer was assigned 0 points. The total knowledge score ranged from 0 to 7, with

**Table 1:** Questionnaire of Knowledge, Awareness, Attitude, and Practice towards COVID-19 (correct rate, % of the total sample)

Code	Questionnaire	Responses		
<b>KNOWLEDGE</b>				
K1	Are you completely aware about the present situation on COVID-19 pandemic outbreak? (97.30%)	Yes	No	I don't Know
K2	Fever, cough, difficulty in breathing are the main symptoms of COVID-19 (98.4%)	TRUE	False	I don't know
K3	There is no effective cure for COVID-19 currently, but early symptomatic and supportive treatment can help most patients recover from the infection (95.7%)	TRUE	False	I don't know
K4	All persons infected with corona virus will not develop as severe cases. Mostly elderly population with chronic illness are more likely to be severe cases (84.1%)	True	False	I don't know
K5	The COVID-19 virus spreads via respiratory droplets of infected individuals (93.1%)	TRUE	False	I don't know
K6	Non-infected and asymptomatic normal people should wear face masks every time to prevent COVID-19 infection (38.6%)	TRUE	False	I don't know
K7	Non-infected and asymptomatic normal people should wash their hands regularly with soap / handwash and sanitize their hands to prevent COVID-19infection (98.3%)	TRUE	False	I don't know
<b>AWARENESS</b>				
AW1	Consumption of non-vegetarian diet would result in the infection of COVID-19 virus (70.1%)	TRUE	False	I don't know
AW2	To prevent community transmission, individuals should avoid going out and should remain in their house (98.9%)	TRUE	False	I don't know
AW3	Isolation / quarantine of the infected people and symptomatic treatment in a proper place are effective ways to reduce the spread of virus (98.1%)	TRUE	False	I don't know
<b>ATTITUDES</b>				
AT1	Do you agree that COVID-19 will be controlled finally in the world? (82.3%)	Agree	Disagree	I don't know
AT2	Do you have confidence that our country will win the battle against COVID-19 pandemic? (89.3%)	Yes	No	I don't know
<b>PRACTICES</b>				
P1	Are you going out to meet your friends / relatives in this lockdown period? (97.9%)	Yes	No	
P2	Are you regularly washing your hands at home for effective hand hygiene? (99%)	Yes	No	
P3	Do you regularly wear mask irrespective of symptoms ? (60.70%)	Yes	No	
P4	Are you allowing any visitors / friends at your home ? (93.80%)	Yes	No	

a higher score denoting a better knowledge of COVID-19. In our sample, 0.42 coefficient of the knowledge questionnaire indicates acceptable internal consistency.

## RESULTS

A total of 12091 participants completed the survey questionnaire. The average age was 33.0 years (standard deviation [SD]: 10.7, range: 16-89), 6991 (57.9%) were women, 6171 (51.1%) hold an undergraduate bachelor's degree or above, and 7625 (63.61%) are from urban locality. Other demographic characteristics are shown in Table 2.

The majority of the respondents agreed that COVID-19 will finally be successfully controlled in India (89.3%). Rates of reporting "disagree" and "I don't know" were 2.5% and 8.2%, respectively. But, there was a slight different response for COVID-19 control in the world. 82.4% agreed that COVID-19 will be controlled in the world. Rates of reporting "disagree" and "I don't know" were 5.9% and 11.7%, respectively. The attitude towards the final success in controlling COVID-19 significantly differed across genders, education levels, occupation categories, and residence places ( $P < 0.05$ ). In additions, respondents reporting "disagree" and "I don't know" had significantly lower knowledge scores than those reporting "agree" ( $P < 0.001$ ) (Table 4).

Multiple logistic regression analysis found that marital status of "unmarried (vs. married, OR:

1.30,  $P$ -value 0.003) and COVID-19 knowledge score (OR: 0.76  $P < 0.0001$ ) were significantly associated with disagreement on the final success in controlling the disease. Male gender (vs. Female OR: 1.75,  $P < 0.001$ ), age-groups of 16-89 years (OR: 0.52,  $P$ -value  $< 0.0001$ ), education levels of high school and below (vs Post graduate and above, OR = 1.56,  $P = 0.01$ ), OR: 0.7~1.63,  $P < 0.0001$ , occupations student (vs. unemployed OR: 1.76,  $P = 0.005$ ) and occupation monthly salaried vs unemployed (OR: 1.04,  $P = 0.84$ ), type of locality – rural village (vs. urban, OR: 1.52,  $< 0.0001$ ), and COVID-19 knowledge score (OR: 0.76,  $P < 0.001$ ) were significantly associated with the answer of "I don't know" on AT1 (Table 5).

Nearly all of the respondents (89.3%) had confidence that India will win the battle against COVID-19, while 2.5% had no such confidence. The attitude towards confidence of winning significantly differed across categories of marital status and education levels ( $P < 0.05$ ). The COVID-19 knowledge scores were significantly lower in persons without than with confidence of winning ( $P < 0.001$ ) (Table 4). Multiple logistic regression analysis showed that education levels of undergraduate vs postgraduate degree (OR: 0.21 to 0.36,  $P < 0.0001$ ) and COVID-19 knowledge score (OR: 0.69,  $P < 0.0001$ ) were significantly associated with no confidence of winning. (Table-5)

		Number (%)	Mean ± SD	Z-value	p-value
Gender	Male	5100 (42.1%)	6.05 ± 0.9	1.17	0.24
	Female	6991 (57.9%)	6.06 ± 0.9		
Age	16-29	8593 (71.2%)	6 ± 0.9	250.9	<0.0001
	30-49	2943 (24.3%)	6.25 ± 0.9		
	>= 50	555 (4.5%)	5.9 ± 1.3		
Marital status	Married	3487 (28.3)	6.18 ± 0.9	159.7	<0.0001
	Unmarried	8471 (70.7%)	6.0 ± 0.9		
	Divorcee / Widow	133 (1%)	6.22 ± 0.6		
Education	Diploma	532 (4.4%)	5.6 ± 1.4	314.9	<0.0001
	High school & below	401 (3.3%)	5.52 ± 1.5		
	Post Graduate and above	4987 (41.2%)	6.21 ± 0.8		
	Undergraduate	6171 (51.0%)	6.01 ± 0.9		
Occupation	Business / Entrepreneur	991 (8.2%)	6.13 ± 1.0	241.3	<0.0001
	Salaried – Monthly	4272 (35.3%)	6.18 ± 0.9		
	Salaried - unorganized sector / weekly / daily labor	211 (1.7%)	6.06 ± 0.8		
	Student	5922 (49.0%)	5.96 ± 0.9		
Type of locality	Unemployed	695 (5.7%)	5.98 ± 1.1		
	Others - Hilly / Mountain, Desert, Island	62 (0.52%)	4.92 ± 2.0	48.74	<0.0001
	Rural – Village	1688 (13.96%)	5.98 ± 0.9		
	Semi urban – Town	2716 (22.46%)	6.11 ± 0.9		
	Urban – City	7625 (63.06%)	6.06 ± 0.9		

**Table 2:** Demographic characteristics of participants and knowledge score of COVID-19 by demographic variables

**Table 3:**Results of multiple linear regression on factors associated with poor COVID-19 knowledge.

Variable	Coefficient	SE	t-value	p-value
Age (10-29 vs 30-49)	0.25	0.02	13.15	<0.0001
Marital status (Unmarried vs Married)	-0.18	0.02	-10.07	<0.0001
Education (Diploma vs Post graduate and above)	0.3	0.02	15.34	<0.0001
Education (High school & below vs Post graduate and above)	0.68	0.04	15.31	<0.0001
Education (Undergraduate vs Post graduate and above)	-0.2	0.01	-12.6	<0.0001
Occupation (Business / Entrepreneur vs. Unemployed)	-0.04	0.01	-2.8	0.005
Occupation (Salaried – Monthly vs. Unemployed)	-0.07	0.01	-5.56	<0.0001
Occupation (Salaried – unorganized sector vs. Unemployed)	-0.04	0.04	-1.01	0.31
Occupation (Student vs. Unemployed)	0.02	0.04	0.46	0.65
Type of locality (Others vs Urban-city)	0.38	0.04	9.89	<0.0001
Type of locality (Rural -village vs Urban-city)	0.04	0.01	3.45	0.001
Type of locality (Semi urban-town vs Urban-city)	-0.04	0.02	-2.14	0.03

**Table 4:** Attitudes towards COVID-19 by demographic variables

Characteristics	Attitude n (%), mean (SD)						
		AT1			AT2		
		Agree	Disagree	Don't know	Yes	No	Don't know
Gender	Male	4167	402	531	4492	232	376
	Female	5795	320	876 ***	6312	82	597 ***
Age	10-29	7009	604	980	7705	191	697
	30-49	2489	111	363	2596	123	224
	>=50	484	7	64 ***	503	0	52 ***
Marital status	Married	2894	175	418	3098	149	240
	Unmarried	6945	547	979	7583	165	723
	Divorcee / Widow	123	0	10 ***	123	0	10 ***
Education	Diploma	421	54	57	470	11	51
	High school & below	317	39	45	363	14	24
	Post Graduate and above	4118	227	642	4362	213	412
	Undergraduate	5106	402	663 ***	5609	76	486 ***
Occupation	Business / Entrepreneur	833	59	99	861	61	69
	Salaried – Monthly	3537	188	547	3778	115	379
	Salaried - unorganized sector / weekly / daily labor	180	10	21	190	0	21
	Student	4863	437	622	5352	118	452
	Unemployed	549	28	118 ***	623	20	52 ***
Type of locality	Others - Hilly / Mountain, Desert, Island	27	11	24	38	0	24
	Rural – Village	1391	145	152	1632	7	49
	Semi urban – Town	2247	135	334	2395	73	248
	Urban – City	6247	431	897 ***	6739	234	652 ***
Knowledge score		6.10 (0.8)	5.87 (1.05)	5.85 (1.3) ***	6.09 (0.8)	5.79 (1.2)	5.80 (1.6) **

\*p<0.05,  
\*\*p<0.01,  
\*\*\*p<0.0001

The vast majority of the participants knew that to prevent community transmission, individuals should avoid going out and should remain in their house and they adhered to it (98.9%) and wore masks irrespective of symptoms when going out (60.7%) in recent days. There was still a small portion of the participants who had visited their friends / relatives and crowded places (2.05%) and had not worn masks when leaving home (39.27%) recently. The rates of these four practices significantly differed across demographic groups (P<0.05), except for the

rates of visiting friends / relatives and going to a crowded place by residence place (Table 6).

Multiple logistic regression analysis showed that male gender (vs. female, OR: 35, <0.0001), age 16-29 (vs. 30-89, OR : 0.57, P= 0.002), Education High school vs (Post graduate, OR :0.21, P <0.0001), occupation of “students” (vs. unemployed, OR: 1.21, P=0.40), type of locality others (vs. urban, OR=0.20, P <0.0001) COVID-19 knowledge score (OR: 0.82, P = 0.01) were significantly associated with meet your friends / relatives in this lockdown period. (Table 7)

**Table 5:** Results of multiple binary logistic regression analysis on factors significantly associated with attitudes towards COVID-19.

Variable	OR (95% CI)	P-value
<b>AT1 (Disagree vs agree)</b>		
Gender (Male vs Female)	1.75 (1.5 – 2.0)	<0.0001
Age (16-29 vs 30-89)	0.52 (0.42 – 0.64)	<0.0001
Marital status (Unmarried vs Married)	1.30 (1.09 – 1.55)	0.003
Education (Diploma vs Post graduate and above)	1.63 (1.21 – 2.20)	0.001
Education (High school & below vs Post graduate and above)	1.56 (1.10 – 2.21)	0.01
Education (Undergraduate vs Post graduate and above)	0.7 (0.59 – 0.83)	<0.0001
Occupation (Business / Entrepreneur vs. Unemployed)	1.39 (0.87 – 2.20)	0.16
Occupation (Salaried – Monthly vs. Unemployed)	1.04 (0.69 – 1.57)	0.84
Occupation (Salaried – unorganized sector vs. Unemployed)	1.09 (0.52 – 2.29)	0.82
Occupation (Student vs. Unemployed)	1.76 (1.19 – 2.61)	0.005
Type of locality (Others vs Urban-city)	5.95 (2.93 – 12.08)	<0.0001
Type of locality (Rural -village vs Urban-city)	1.52 (1.25 – 1.85)	<0.0001
Type of locality (Semi urban-town vs Urban-city)	0.88 (0.72 – 1.07)	0.2
Knowledge score	0.76 (0.70 – 0.82)	<0.0001
<b>AT1 (Unknown vs agree)</b>		
Gender (Male vs Female)	0.84 (0.75 – 0.95)	0.004
Age (10-29 vs 30-49)	1.05 (0.92 – 1.19)	0.44
Marital status (Unmarried vs Married)	0.98 (0.86 – 1.10)	0.68
Education (Diploma vs Post graduate and above)	0.87 (0.65 – 1.16)	0.34
Education (High school & below vs Post graduate and above)	0.91 (0.66 – 1.26)	0.57
Education (Undergraduate vs Post graduate and above)	0.83 (0.74 – 0.94)	0.002
Occupation (Business / Entrepreneur vs. Unemployed)	0.55 (0.42 – 0.74)	<0.0001
Occupation (Salaried – Monthly vs. Unemployed)	0.72 (0.58 – 0.89)	0.003
Occupation (Salaried – unorganized sector vs. Unemployed)	0.54 (0.33 – 0.89)	0.01
Occupation (Student vs. Unemployed)	0.59 (0.48 – 0.74)	<0.0001
Type of locality (Others vs Urban-city)	6.24 (3.58 – 10.86)	<0.0001
Type of locality (Rural -village vs Urban-city)	0.77 (0.64 – 0.92)	0.004
Type of locality (Semi urban-town vs Urban-city)	1.04 (0.91 – 1.19)	0.53
Knowledge score	0.77 (0.73 – 0.81)	<0.0001
<b>AT2:</b>		
Gender (Male vs Female)	3.98 (3.08 – 5.13)	<0.0001
Age (10-29 vs 30-49)	1.91 (1.52 – 2.41)	<0.0001
Marital status (Unmarried vs Married)	0.45 (0.36 – 0.57)	<0.0001
Education (Diploma vs Post graduate and above)	0.48 (0.26 – 0.88)	0.02
Education (High school & below vs Post graduate and above)	0.79 (0.45 – 1.37)	0.4
Education (Undergraduate vs Post graduate and above)	0.28 (0.21 – 0.36)	<0.0001
Occupation (Business / Entrepreneur vs. Unemployed)	2.21 (1.32 – 3.69)	0.003
Occupation (Salaried – Monthly vs. Unemployed)	0.95 (0.58 – 1.54)	0.83
Occupation (Salaried – unorganized sector vs. Unemployed)	0	0.99
Occupation (Student vs. Unemployed)	0.69 (0.42 – 1.11)	0.13
Type of locality (Others vs Urban-city)	0	0.99
Type of locality (Rural -village vs Urban-city)	0.12 (0.06 – 0.26)	<0.0001
Type of locality (Semi urban-town vs Urban-city)	0.88 (0.67 – 1.15)	0.34
Knowledge score	0.69 (0.62 – 0.78)	<0.0001

**Table 6:**Practices towards COVID-19 by demographic variables.

		Practice, n(%) or mean (SD)							
		P1		P2		P3		P4	
		Yes	No	Yes	No	Yes	No	Yes	No
Gender	Male	166	4934	5040	60	3218	1882	348	4752
	Female	82	6909 ***	6932	59	4124	2867 ***	396	6595 **
Age	10-29	188	8405	8519	74	5369	3224	519	8074
	30-49	37	2906	2898	45	1696	1247	194	2749
	>=50	23	532 ***	555	0 ***	277	278 ***	31	524
Marital status	Married	61	3426	3454	33	2006	1481	226	3261
	Unmarried	187	8284	8385	86	5273	3198	518	7953
	Divorcee / Widow	0	133	133	0	63	70 ***	0	133 **
Education	Diploma	12	520	532	0	349	183	54	478
	High school & below	21	380	401	0	240	161	28	373
	Post Graduate and above	58	4929	4923	64	2835	2152	250	4737
Occupation	Undergraduate	157	6014 ***	6116	55 **	3918	2253 ***	412	5759 ***
	Business / Entrepreneur	23	968	991	0	600	391	53	938
	Salaried – Monthly	39	4233	4201	71	2456	1816	300	3972
	Salaried - unorganized sector / weekly / daily labor	0	211	211	0	93	118	43	168
	Student	163	5759	5891	31	3794	2128	310	5612
Type of locality	Unemployed	23	672 ***	678	17 ***	399	296 ***	38	657 ***
	Others - Hilly / Mountain, Desert, Island	7	55	62	0	35	27	7	55
	Rural – Village	14	1674	1678	10	968	720	55	1633
Knowledge score	Semi urban – Town	38	2678	2695	21	1593	1123	156	2560
	Urban – City	189	7436 ***	7537	88	4746	2879 ***	526	7099 ***
		6.20 (1.2)	6.05 (0.9) ***	6.05 (0.9)	6.21 (1.2) **	5.84 (0.8)	6.38 (0.91) ***	5.88 (1.3)	6.07 (0.9) **

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

	OR (95% CI)	P-value
<b>P1</b>		
Gender (Male vs Female)	0.35 (0.27 – 0.46)	<0.0001
Age (16-29 vs 30-89)	0.57 (0.40 – 0.81)	0.002
Education (High school vs. Post graduate)	0.21 (0.13 – 0.35)	<0.0001
Occupation (Student vs. Unemployed)	1.21 (0.78 – 1.88)	0.4
Type of locality (Others vs Urban-city)	0.20 (0.09 – 0.44)	<0.0001
Knowledge score	0.82 (0.69 – 0.96)	0.01
<b>P2</b>		
Age (10-29 vs 30-49)	0.56 (0.38 – 0.81)	0.002
Education (High school vs. Post graduate)	0	-
Occupation (Student vs. Unemployed)	0.21 (0.12 – 0.38)	<0.0001
Type of locality (Others vs Urban-city)	0	-
Knowledge score	1.25 (0.99 – 1.57)	0.06
<b>P3</b>		
Gender (Male vs Female)	0.84 (0.78 – 0.91 )	<0.0001
Age (10-29 vs 30-49)	0.82 (0.75 – 0.89)	<0.0001
Education (High school vs. Post graduate)	0.88 (0.72 – 1.09)	0.24
Marital status (Unmarried vs Married)	1.22 (1.12 – 1.32)	<0.0001
Occupation (Student vs. Unemployed)	0.76 (0.64 – 0.89)	0.001
Type of locality (Others vs Urban-city)	1.27 (0.77 – 2.10)	0.35
Knowledge score	2.46 (2.32 – 2.60)	<0.0001
<b>P4</b>		
Gender (Male vs Female)	0.82 (0.71 – 0.95)	0.009
Age (10-29 vs 30-49)	1.09 (0.93 – 1.30)	0.28
Education (High school vs. Post graduate)	0.70 (0.47 – 1.05)	0.09
Marital status (Unmarried vs Married)	0.94 (0.80 – 1.10)	0.45
Occupation (Student vs. Unemployed)	1.05 (0.74 – 1.48)	0.79
Type of locality (Others vs Urban-city)	0.58 (0.26 – 1.28)	0.18
Knowledge score	1.21 (1.13 – 1.29)	<0.0001

## DISCUSSION

To our knowledge and understanding, this would be the first online study in India examining the KAAP towards COVID-19 among Indian Citizens. Since the survey was conducted online, mostly educated population with access to internet participated in the study. We found an overall correct rate of 86.5% on the knowledge questionnaire, showing that most respondents are knowledgeable about COVID-19. The vast majority of the participants also held an optimistic attitude towards the COVID-19 epidemic: 82.3% believed that COVID-19 will finally be successfully controlled, and 89.3% had confidence that India can win the battle against the pandemic virus.

Most of the Indians followed the strict practice guidelines, and they all avoided going out to visit their relatives and friends / visiting crowded places (97.9%) and wore masks when leaving the home irrespective of symptoms (60.7%) during the rapid rise period of the COVID-19 outbreak, whereas 39.3% were not wearing masks during the online survey period in very early stage of COVID-19 pandemic in India. We also analyzed the characteristics of KAAP towards COVID-19 and identified some demographic factors associated with KAAP; these findings are useful for public health policy-makers and health workers to recognize target populations for COVID-19 prevention and health education.

The finding of a high correct rate of COVID-19 knowledge in Indian citizens was unpredicted, because this online survey was conducted during the early stage of the disease spread in India. We consider that this is primarily due to the sample characteristics: 92.2% of the study sample held an undergraduate degree or higher. Because of the serious situation of the pandemic and the early public health strategies like People Curfew (Janatha Curfew) imposed for 14-hours on 22 March 2020 giving a strong signal to the Indian citizens about the onset of the worst pandemic crisis. Further overwhelming news reports on this public health emergency, this population would actively learnt the knowledge of this infectious disease from various channels of information such as 24x7 news channels in all regional vernacular languages telecasting non-stop COVID-19 news to the viewers, special news coverage in all print media, information sources from all nodal central and state government websites, and social media platforms. The significant positive association between levels of education and COVID-19 knowledge scores supports this speculation.

The study conducted by Bao-Liang Zhong et al in Wuhan, China this January 2020 concluded that vast majority of the participants also held an optimistic attitude towards the COVID-19 epidemic in China: 90.8% believed that COVID-19 will finally be successfully controlled, and 97.1% had confidence that China can win the battle against the virus [13].

During the SARS epidemic a similar study was conducted in China, in which 70.1-88.9% of the Chinese residents believed that SARS can be successfully controlled or prevented, and 94.7-100% had confidence that China can win the battle against SARS [14-16]. Similarly, the efforts made by the health authorities and various governmental bodies contained the SARS epidemic.

These figures from earlier studies support our findings, the final success of combating the COVID-19 and confidence of winning in the battle against COVID-19. The optimistic attitude of the Indian citizens could be related to the unprecedented COVID-19 control measures by the coordinated efforts from the central, state, and

local health authorities in association with Police forces, District administration authorities ranging from national complete lockdown, shut down of all kind of educational institutions / mass gathering premises, closing all the airports, discontinuing all the transportation services excluding essential transportation, sealing the state and district borders enhanced people's confidence in winning the COVID-19 pandemic. Second, the untiring efforts of the health care workers from across the country in testing; treating, quarantining, and contact-tracing the COVID-19 patients also increased the people's confidence.

Third, the good knowledge about COVID-19 among the Indian citizens can so explain this phenomenon, because as shown by results of multiple analyses, higher COVID scores were significantly associated with less likelihood of "disagree" and "I don't know" answers to question AT1 and "no" answer to question AT2.

Although attitudes towards COVID-19 were optimistic, most residents took precautions to prevent infection by COVID-19: not going to crowded places and wearing masks when going outside. Social distancing and personal hygiene like wearing of masks and frequent hand washing seem to be the main weapon to combat COVID-19. These strict preventive measures and health care policy guidelines could be primarily attributed to the very strict prevention and control measures implemented by local governments. Second, they also could be the result of the residents' good knowledge regarding the high infectivity of the COVID-19 virus, which can be easily transmitted between people via invisible respiratory droplets. Unfortunately, the present study still showed that 2.1% citizens went out during this lock down period and 30.7% did not wear masks if they are asymptomatic.

The findings from previous studies regarding age and gender patterns of risk-taking behaviors [17,18], men and late adolescents engage in risk-taking behaviors. In line with these previous findings, it was found significant association between male gender and potentially dangerous practices towards COVID-19 in this online study. The significantly higher risk of going to a crowded place can be attributed to their young age. The significantly higher risk of not wearing

a mask may be attributed to the initial rumors about shortage of masks for health care workers and COVID-19 infected patients. It was also an initial propaganda that masks should be used judiciously by health care workers and people with infections. As the cases surged up, the mask guidelines were revised accordingly. Later on the Government of India revised the guidelines and made wearing masks compulsory to all citizens irrespective of symptoms, while coming out for essential services.

It is worth mentioning that higher COVID-19 knowledge scores were found to be significantly associated with a lower likelihood of negative attitudes and potentially dangerous practices towards COVID-19 epidemic in this study. These findings clearly indicate the importance of improving residents' COVID-19 knowledge via health education, which may also result in improvements in their attitudes and practices towards COVID-19. Our findings of the demographic factors associated with KAAP towards COVID-19 are very much reliable with previous studies on COVID-19 [13] and SARS in 2003 [19]. These findings further suggest that the health education intervention would be more effective if it targets certain demographic groups, for example, the COVID-19 knowledge may be greatly increased if the health education programs are specifically designed and targeted for men highlighting the severity of the pandemic mortality rates.

The strength of this study lies in its large sample recruited during a critical period, the early stage of the COVID-19 outbreak. Nevertheless, compared to the most recent national population statistics of India in 2011 by Office of the Registrar General & Census Commissioner, (20), our sample was obviously very small and meager and it is over-representative of women, well-educated people, and employed people. Given the significant associations between these demographic variables and KAAP towards COVID-19 revealed in this study, we may have overestimated knowledge and rates of preventive practices and undervalued the rates of positive attitudes towards COVID-19 of Indian Citizens. Considering that educational attainment and occupation are often used as proxy measures of socioeconomic status, strictly

speaking, our findings can only be generalized to Indian populations of a relatively upper middle and high socioeconomic status.

Due to limited access to internet and online health information resources, vulnerable populations of Indian Citizens under the COVID-19 epidemic such as laborers, guest workers, people living in closed clusters like slums, and rural people at grass-root level are more likely to have poor knowledge, negative attitudes, and inapt preventive practices towards COVID-19. Therefore, KAAP towards COVID-19 of vulnerable populations should be strengthened with special research attention in today's India. In addition to the limited sample representativeness, the second limitation of this study is the unstandardized and inadequate assessment of awareness, attitudes and practices towards COVID, which should be developed via focus group discussion and in-depth interview and constructed as multi-dimensional measures. Due to the very limited time for developing the questionnaire, these were measured with three, two, and four simple questions respectively.

## CONCLUSION

In conclusion, our findings suggest that Indian Citizens of a relatively high level of education, and employment, in particular women, have good knowledge, confident attitudes, and follow appropriate practices towards COVID-19 during the rapid rise period of the pandemic outbreak. In addition, effective health education programs should be aimed at improving COVID-19 knowledge is helpful for encouraging an optimistic attitudes and maintaining safe practices. Hopefully, under the combined efforts of Central & State government, India surely will win the battle against COVID-19 in the near future. Due to the limitation in representativeness of the sample, more studies are warranted to investigate the KAAP towards COVID-19 among Indian citizens of low economic status and rural background.

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