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Empirical analysis of knowledge, attitude and practice (KAP) towards COVID-19 among residents of Jaipur district, Rajasthan, India: an online cross-sectional community based study

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ABSTRACT

Background

Coronavirus disease (COVID-19), an infectious disease caused by the SARS-CoV-2 virus, has become a pandemic crisis. Good Knowledge, Attitude and Practice (KAP) can prevent the spread of the virus. The present study aimed to identify the current status of KAP associated with COVID-19 characteristics, prevention, control and treatment options within the study population.

Methods

A cross-sectional community-based online survey was conducted with 500 participants. A link was sent to members of the public of Jaipur district, Rajasthan India. Data were analyzed by the student 't' test and F-Statistics. Bivariate and multiple linear regression were applied to find any association between different variables. A p-value <0.05 was considered significant.

Results

Respondent knowledge and attitude was rated 'Good' overall (99%) regarding COVID-19 preventative measures, with practice scoring slightly less (89%). A significant positive relationship was observed between knowledge and attitude (r=0.177, p=0.01), but a positive attitude does not automatically result in good practice (r=-0.105, p=0.05). Knowledge was better amongst urban, more highly educated respondents and amongst those working in the medical community. The study identified some common misunderstandings over how the virus spreads, including that it can be transmitted through dairy products and meat consumption, and through the faecal-oral route.

Conclusion

Rural residents, who tend to be less educated than urban residents, and the less educated urban residents were less aware of COVID-19 characteristics, treatment options and mechanisms of disease spread. This highlights a need for continuing public health education, particularly amongst rural and less educated urban populations.

Keywords: Attitude, COVID-19, KAP, Knowledge, Practice

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a worldwide public health threat that became a pandemic crisis. In response to the critical health situation across the world, COVID-19 was declared a public health emergency of international concern by the World Health Organization (WHO) on January 30, 2020.[1] The disease is caused by a virus, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which is primarily spread between people by direct or indirect contact through droplets produced by coughing, sneezing and talking.[2,3] By the end of December 2021, approximately 281,400,000 COVID-19 cases had been recorded worldwide, resulting in nearly 5.5 million confirmed deaths, of which 35 million cases and just under 500,000 deaths had been reported in India. Rajasthan accounted for nearly one million cases and around 9,000 deaths.[4,5] To combat this public health crisis, WHO and the Government of India released public guidelines for preventive measures including the use of face masks, hygiene practices, social distancing and vaccination information.[5,6]

COVID-19 has posed a huge challenge to India due to its large population and many high-density residential areas, which has compounded virus spread. By the end of 2021, India had seen two waves of COVID-19 (the first from March 2020 to January 2021 and the second from March 2021 to August 2021). A third wave is considered likely. Curtailing the spread of COVID-19 in the community requires people to adhere to COVID-19 appropriate behaviour (CAB). Public participation and adoption of CAB has a causal relation with people's knowledge, attitudes and practices (KAP) towards COVID-19. Evidence shows that public knowledge is critical in tackling pandemics and miscommunication.[7-9] Public awareness and adherence to CAB preventative measures is crucial during an unlocking phase as well as to prevent the recurrence of COVID-19, particularly in light of the prediction of a third wave.

This community-based study aimed to assess the knowledge, attitudes and practice (KAP) towards COVID-19 and its associated factors among residents of the Jaipur district of Rajasthan, India. KAP is critical for health prevention and promotion. The approach helps to explain how well the public understands the disease's origins; recognizes symptoms; and understands treatment options and outcomes. Within community settings, KAP plays a significant role in controlling any public health problem. Hence, understanding KAP for COVID-19 will contribute to identifying gaps in community participation in the control and prevention this disease. The present study contributes to existing studies on KAP for COVID-19 with a specific focus on Rajasthan, India.

METHODS AND MATERIALS

The study utilized an online cross-sectional, community-based, self-reported, quantitative study conducted on residents of Jaipur district. Clearance was received from the institutional clinical trial screening committee and ethics committee of the authors' institution (No. 579/MC/EC/2020 Dated 18/8/20). The survey was conducted between January and March 2021 during an unlock period. The sample size for the Jaipur population was calculated to be 400 subjects at 95% confidence interval and 10% relative allowable error, assuming 50% of responses would have correct knowledge. An online Google form was used to capture responses from residents until 500 responses had been received.

A structured questionnaire was designed for Google forms and a link to this was sent via various WhatsApp groups and personal mobile numbers to residents of Jaipur district. To ensure wide coverage, personal mobile numbers were obtained from the healthcare centre database of SMS Medical College and Hospital, Jaipur, Rajasthan, and patients at the facilities were also approached randomly and asked for their phone numbers, so that they could be sent the link, and were also asked to help with finding other appropriate WhatsApp groups. After receiving the completed Google forms, a guideline of COVID-19 information issued by the Government of India was sent to each participant, to ensure that the correct information regarding COVID-19 transmission, control and preventive measures was communicated to all respondents. This assurance was given for two main reasons: first, it is ethical to impart knowledge and second, the promise motivated subjects to respond.

The study aim and process were explained. Participants were told that participation was voluntary and that confidentiality and anonymity were guaranteed. The introductory section of the questionnaire explained that the study was about the novel coronavirus (COVID-19), would ask health-related questions, and should take around 15 minutes to complete. A returned Google Form was considered as an acceptance by the subject to be included in the study. Incomplete forms and forms filled by respondents under 15 years of age were excluded from the study. A total 502 participant responses were included in the study after removing 29 incomplete and duplicate forms.

The Google form consisted of two sections. The first section contained general information, including sociodemographic variables such as age, gender, place of residence, education, occupation and recorded if the respondent had any chronic diseases. The second section contained the KAP questions in three subsections: knowledge, attitude and practice. The online questionnaire was created using a standard WHO sample survey tool and guidance.[10,11] The questionnaire was reviewed by experts and pretested with a few selected residents of Jaipur to confirm its readability, respondents' understanding of KAP statements, the flow of sequence (sequence of the questions) and technological ease of filling and submitting the form. The questionnaire was updated accordingly. Residents who were involved in the trial were excluded from the main study.

Knowledge

Questions regarding participants' knowledge of COVID-19 were classified into two sub-sections: first, their knowledge of characteristics and symptoms of the disease (items K1 to K9: Knowledge Test A) and second, knowledge of prevention, control and transmission of the disease (items K10 to K22: Knowledge Test B). Item K1 to K8 covered characteristics of the disease, K9 dealt with symptoms of disease, items K10 to K14 enquired about prevention and control and items K15 to K20 asked about the transmission of disease. Item K21 was about immunity and item K22 determined knowledge regarding vaccination. Answers were coded with a score of 1 (for the correct answer) and 0 (for an incorrect answer, or 'don't know'). Item K15 and K18 were false statements, and hence, reverse scoring was given. The total score achievable ranged from 0 to 22. Scores for each question were summed for each respondent to provide a total score. A score ≥ 12 was set as a cut off for 'Good' knowledge and accordingly, participants were classified into two groups: respondents with poor knowledge (those who scored 0–11) and with good knowledge (a score of 12–22).

Attitude

Attitudes were assessed against 12 items (A1 to A12). Each statement had five options and scoring was given on a 5-point Likert Scale, i.e. Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1. Item A8 and A9 were false statements and reverse scoring was allocated to these items. The total score was calculated by summing up scores for all 12 items under the attitude section. Total scores ranged from 0 to 60 and respondents were classified into two groups according to their scoring: 0 to 30 for negative attitudes and 31 to 60 for positive attitudes, where 'negative attitude' is defined as an attitude in contrast to that encouraged by the Government of India or WHO, and a 'positive attitude' defined as one supportive of official recommendations.

Practice

Eight statements were included in the questionnaire to review practices followed by the respondents. Each statement had three options of how to respond (not at all = 0; sometimes; or always). Reverse scoring was allocated to items P3, P4, P7 and P8. The total score possible was 16 and respondents were classified into two groups according to their scoring, i.e. respondents with scores of 0 to 8 were categorized as having poor practice and respondents with a score of 9 to 16 were categorized as following good practice.

Gender, place of residence, age, education, occupation, profession and presence of chronic disease were independent variables. The knowledge score, attitude score and practice score were dependent outcome variables. The data obtained through the Google sheet and further edited, sorted and coded in Microsoft Excel 2019. Data analysis was

performed by using SPSS IBM version 2.0. Data were expressed either as percentages, or in mean ± SD. The quantitative data were analyzed by unpaired student 't' test and by F-statistics/ANOVA for multiple group comparison. Bivariate correlation was used to find a correlation between dependent variables, while multiple linear regression was applied to find association between independent and dependent variables. For significance, $p<0.05$ was considered as significant.

RESULTS

Out of the 502 respondents, 61% were female and 39% male; 61% were urban residents and 39% rural; 67% were government employees and 33% private sector. The mean age was 33 years with SD ±12, ranging from 15 to 80 years. All participants had some level of formal education and more than 90% were graduates. Over 80% of respondents were from non-medical professions. Most respondents (91%) had no chronic disease. (Table 1)

Table 1 Sociodemographic profile of participants (n=502)

Independent Variables	N	(%)
Gender		
Male	196	39
Female	306	61
Residence		
Urban	307	61
Rural	195	39
Age (years)		
≤25	169	34
26-50	295	59
≥51	38	8
Education		
Elementary School	7	1
Higher School	35	7
College	460	92
Occupation		
Government	337	67
Private	165	33
Profession		
Medical	90	18
Non-medical	412	82
Chronic disease		
Present	43	9
Absent	459	91

n= Number of subjects, %= Percentage of subjects

Knowledge component

More than 90% of respondents had good knowledge of the basic characteristics of COVID-19 (that it is a virus, it is a contagious disease, and its incubation period is 3-14 days), but correct knowledge of COVID-19 treatment was limited to only 52% of respondents. Almost all participants (94–99%) had good knowledge of symptoms of the disease and the key methods of prevention and control. Statements K15 (which asked whether the virus could be transmitted through animal food products) and K18 (which asked if the virus could be transmitted through the faecal-oral route), revealed some misunderstandings regarding disease transmissions as only 27% and 38% of respondents responded correctly, respectively. Not all respondents were sure about the spread of infection in closed, less ventilated rooms, or about the level of immunity against COVID-19 among people who had recovered from the disease, as the rate of correct answers to these questions were 77% (K20) and 71% (K21) respectively (See Table 2).

Attitude component

Attitudes towards COVID-19 control were generally positive. In the case of statement A7, regarding whether there is sufficient awareness of COVID-19 in society, the response was mixed, however, with 65% agreeing or strongly agreeing and 30% disagreeing or strongly disagreeing. More than a quarter (27%) of respondents wrongly considered that COVID-19 causes death in all cases, and 34% thought it can be transmitted through domestic pets. The response for statements A10, A11 and A12 revealed that the majority of respondents do not support quarantine, physical distancing and vaccination (67%, 79% and 68% respectively disagreed or strongly disagreed) as essential for elimination of the disease (Table 3).

Practice component

A majority of respondents claimed to observe COVID-19 appropriate and responsible practice. For example, 77% reported not to have visited a restaurant in the last month and 63% had not used public transport. However, 54% had received at least one visitor into their house in the last month, and 7% had done this more than 10 times (P6). Regular handwashing was observed by 89% (P3) and 89% claimed to always wear a mask (P7) when leaving the house. Use of vitamin supplements and herbal powder recommended by official agencies (P4) was low, as was regular use of the Aarogya Setu App developed by the Government of India for contact tracing, syndrome mapping and medical advisory on COVID-19 (P8). (See Table 4)

Table 2 Responses to questionnaire about knowledge of COVID-19 (n=502)

	Knowledge statements	Options	Answered correctly n (%)
Knowledge about the characteristics of the disease			
K1	Is COVID-19 a contagious disease?	*Yes, No, Don't Know	458 (91%)
K2	Which of the following is the cause of COVID-19?	Bacteria, *Virus, Fungi, Parasite, Immunodeficiency, Don't know	484 (96%)
K3	How long is the incubation period of COVID-19?	Less than 2 days, 2– 5 days, *3–14 days, Don't know	453 (90%)
K4	Which can be the main treatment of COVID-19?	*Symptomatic treatment, Antibiotics, no treatment, Don't know	263 (52%)
K5	In which age group can COVID-19 be more dangerous?	15– 30 years, 30–50 years, *Above 50 years, Don't know	481 (96%)
K6	Are pregnant women, old people and people with weak immunity at higher risk of COVID-19 infection?	*Yes, No, Don't know	494 (98%)
K7	Is COVID-19 more dangerous for people with cancer, diabetes and chronic respiratory diseases?	*Yes, No, Don't know	494 (98%)
K8	Do some COVID-19 infected patients lose the ability to smell and taste?	*Yes, No, Don't know	439 (87%)
Knowledge about symptoms of the disease			
K9	Are fever, cough, sore throat, body ache, diarrhoea or constipation, headache etc. symptoms of COVID-19?	*Yes, No, Don't know	472 (94%)

Knowledge about prevention and control			
K10	If you suspect COVID-19 infection, will you first measure your body temperature and go to the doctor?	*Yes, No, Don't know	493 (98%)
K11	On suspicion of COVID-19 infection, will you isolate yourself and avoid contact with other people and not go to crowded public places?	*Yes, No, Don't know	497 (99%)
K12	Can eating nutritious food, drinking more water and doing yoga and exercise increase the body's immunity to fight COVID-19?	*Yes, No, Don't know	488 (97%)
K13	Can the spread of the COVID-19 virus be prevented by washing hands with water and soap, using sanitizer and wearing a mask?	*Yes, No, Don't know	495 (99%)
K14	Do you know about Aarogya Setu App**?	*Yes, No, Don't know	481 (96%)
Knowledge about the transmission of disease			
K15	Can COVID-19 spread by consuming dairy products and meat taken from outside?	Yes, No*, Don't know	137 (27%)
K16	Can COVID-19 spread through contact with infected surfaces?	*Yes, No, Don't know	484 (96%)
K17	Is COVID-19 disease spread through cough, sneeze or conversation of COVID-19 infected persons?	*Yes, No, Don't know	493 (98%)
K18	Does the COVID-19 virus spread through the faecal-oral route?	Yes, *No, Don't know	189 (38%)
K19	Does COVID-19 spread without using a mask and talking to another person at a distance of less than 2 metres?	*Yes, No, Don't know	417 (83%)
K20	Is there more chance of spread of COVID-19 in closed and less ventilated AC rooms?	*Yes, No, Don't know	386 (77%)
Knowledge about immunity			
K21	Does immunity arise in a person after COVID-19 infection?	*Yes, No, Don't know	355 (71%)
Knowledge about vaccination			
K22	Do you know about the COVID-19 vaccination	*Yes, No, Don't know	486 (97%)

Yes=1, No=0, Don't Know=0, (K15 and K18 were False), *= Correct Answer, **= (Aarogya Setu is a mobile application developed by Government of India for contact tracing, syndrome mapping and medical advisory on COVID-19), n= Number of subjects, %= Percentage of subjects

Table 3 Response of attitude statements towards COVID-19 (n=502)

	Attitude statement	n (%)				
		Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
A1	I believe that early detection of COVID-19 can improve treatment and outcome	343* (68%)	149 (30%)	8 (2%)	1 (0%)	1 (0%)
A2	I believe that COVID-19 can be treated at home in most cases	117* (23%)	234 (47%)	57 (11%)	78 (16%)	16 (3%)
A3	I believe health education can help prevent COVID-19	290* (58%)	193 (38%)	9 (2%)	6 (1%)	4 (1%)
A4	I believe that COVID-19 infection can be avoided by taking proper precautions.	352* (70%)	142 (28%)	7 (1%)	0 (0%)	1 (0%)
A5	I agree that COVID-19 is a serious disease	289* (58%)	161 (32%)	19 (4%)	28 (6%)	5 (1%)
A6	I believe that COVID-19 is a curable disease	175 (35%)	270 (54%)	37 (7%)	14 (3%)	6 (1%)
A7	I believe that the awareness about COVID-19 in society is sufficient.	127 (25%)	199 (40%)	28 (6%)	134 (27%)	14 (3%)
A8	I believe that COVID-19 causes death in all cases	60 (12%)	74 (15%)	64 (13%)	221 (44%)	83 (17%)
A9	I agree that the COVID-19 disease can be transmitted to humans through domestic pets	49 (10%)	121 (24%)	121 (24%)	165 (33%)	46 (9%)
A10	I agree that it is important to be quarantined after coming in contact with an infected person.	8* (2 %)	146 (29%)	10 (2%)	6 (1%)	332 (66%)
A11	I agree that it is important to maintain mutual physical distance and use a mask during the conversation	10* (2%)	87 (17%)	5 (1%)	1 (0%)	399 (79%)
A12	I believe that complete vaccination is necessary to eliminate COVID-19 infection.	7* (1%)	132 (26%)	20 (4%)	6 (1%)	337 (67%)

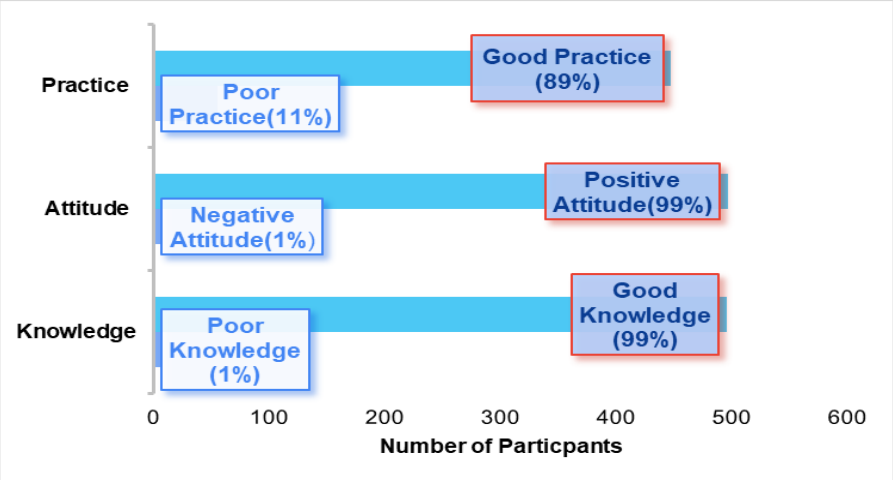
n= Number of subjects, %= Percentage of subjects

Likert scale was scored as follows:
Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1. Item A8 and A9 were false statements and reverse scoring was allocated to these items.
The total score was calculated by summing up scores for all 12 items under the attitude section. Total scores ranged from 0 to 60 and respondents were classified into two groups according to their scoring: 0 to 30 for negative attitudes and 31 to 60 for positive attitude

Table 4 Response to practice statements towards COVID-19 (n=502)

	Practice statement	Options	n (%)
P1	How many times have you gone to a restaurant to eat in the last month?	Not at all	385 (77%)
		1 to 4 times	100 (20%)
		more than 4 times	17 (3%)
P2	How many times have you used public transport in the last month?	Not at all	315 (63%)
		1 to 10 times	143 (28%)
		more than 10 times	44 (9%)
P3	How many times a day do you wash your hands and use sanitizer in the last month?	Not at all	6 (1%)
		1 to 2 times	52 (10%)
		more than 2 times	445 (89%)
P4	Have you used any herbal powder or vitamin supplements as prescribed by the Ministry of AYUSH every day in the last month?	Not at all	223 (44%)
		1 to 2 times	154 (31%)
		more than 2 times	125 (25%)
P5	How many times have you had a group meal or tea with others at the workplace in the last month?	Not at all	354 (71%)
		1 to 10 times	103 (21%)
		more than 10 times	45 (9%)
P6	How many visitors (female/male) have come to your house in the last month	Not at all	232 (46%)
		1 to 10 times	236 (47%)
		more than 10 times	34 (7%)
P7	Have you used a mask while going out of the house in the last month?	Not at all	20 (4%)
		sometimes	37 (7%)
		always	445 (89%)
P8	Have you used the Arogya Setu App regularly in the last month?	Not at all	140 (28%)
		sometimes	228 (45%)
		always	134 (27%)

P3,4,7,8=Reverse scoring, n =Number of subjects, % = Percentage of subjects



The present study data depicts a wide range of scores but in general there appears to be a good level of knowledge, attitude and practice among study respondents. The scores for practice were slightly lower when compared to those for knowledge and attitude, however. (Table 5, Figure 1).

Fig 1 Level of Knowledge, Attitude and Practice among participants

Table 5 Dependent Variable Mean (± SD) Scores and Level of Knowledge, Attitude and Practice

Dependent variables	Number of questions	Range of scores Min-Max	Total score (mean ± SD)	Level (n=502)	
				Poor n (%)	Good n (%)
Knowledge A	9	2-9	8.04±1.05	9 (2%)	492 (98%)
Knowledge B	13	2-13	10.75 ±3.38	11 (2%)	491 (98%)
Total knowledge	22	14-22	180 ±4.44	7 (1%)	495 (99%)
Attitude	12	29-57	41.73 ±12.10	6 (1%)	496 (99%)
Practice	8	8-16	11.79 ± 2.49	55 (11%)	447 (89%)

SD= Standard Deviation, n =Number of subjects, % = Percentage of subjects

Table 6 Distribution of KAP Scores (Mean ± SD) with Sociodemographic profile of study participants

Socio-demographic profile	n	Knowledge scores			Attitude scores			Practice scores		
		Mean	±SD	p value	Mean	±SD	p value	Mean	±SD	p value
Gender										
Male	196	18.86	2.34	0.652	42.08	3.78	0.101	11.34	2.64	**0.001***
Female	306	18.77	2.03		41.51	3.79		12.09	2.34	
Residence										
Urban	307	19.16	1.79	**0.001***	42.34	3.75	**0.001***	11.87	2.37	0.378
Rural	195	18.25	2.53		40.76	3.67		11.67	2.66	
Age (Years)										
≤25	169	18.98	2.16	0.370	41.85	3.87	0.874	10.80	2.56	**0.001***
26-50	295	18.69	2.17		41.66	3.83		12.18	2.31	
≥51	38	18.87	1.98		41.71	3.17		13.18	1.96	
Education										
Elementary School	7	14.57	6.69	**0.001***	40.29	5.15	0.476	11.43	3.54	0.348
Higher School	35	19.34	1.31		42.17	4.48		11.23	2.80	
College	460	18.83	1.99		41.72	3.71		11.84	2.44	
Occupation										
Government	337	18.79	2.08	0.880	41.46	3.71	**0.023***	12.04	2.35	**0.001***
Private	165	18.82	2.29		42.28	3.91		11.29	2.68	
Profession										
Medical	90	19.29	2.82	**0.018***	42.02	3.26	0.420	10.70	2.33	**0.001***
Non-medical	412	18.70	1.97		41.67	3.90		12.03	2.46	
Chronic disease										
Present	43	18.98	1.83	0.581	42.00	3.80	0.625	12.23	2.13	0.229
Absent	459	18.79	2.18		41.70	3.80		11.75	2.52	

*SD= Standard Deviation, n= Number of subjects, *p value<0.05 as significant*

The scores of different sociodemographic profiles varied against Knowledge, Attitude and Practice responses. Knowledge scores were significantly higher among the urban population than rural residents (p value=0.001) and within the medical profession compared with others (p value=0.018). Scores were considerably lower among those who had completed only elementary schooling compared to those who had completed high school and college level education or above. Attitude scores were also significantly higher among urban than rural residents, (p value=0.001) and private sector participants scored higher than public sector employees (p value=0.023). For practice, scores were higher among females than males (p value=0.001) and the older age group (26 to 50 years and above 50 years) than in those 25 years of age or younger (p-value=0.001); in government sector employees compared with private sector employees (p-value=0.001) and non-medical professionals compared with others (p-value=0.001). The other independent variables had statistically non-significant differences (see Table 6).

There was a significant positive relationship between knowledge and attitude scores, r (500) = 0.177, p value=0.01, whereas there was a significant negative relationship between attitude and practice scores, r (500) = -0.105, p value=0.05. Knowledge scores predict 3% of the variance in attitude scores and 0.2% of the variance in practice scores. Attitude scores were negatively associated with practice scores, with 0.1% variance (See Figure 2).

Correlations (N=502)

		Know' Scores	Attitude Scores	Practice Scores
Knowledge Scores	Pearson Correlation	1	.177**	.041
	Sig. (2-tailed)		.000	.362
Attitude Scores	Pearson Correlation		1	-.105*
	Sig. (2-tailed)			.019
Practice Scores	Pearson Correlation			1
	Sig. (2-tailed)			

**. Correlation significant at the 0.01 level (2-tailed).
*. Correlation significant at the 0.05 level (2-tailed).

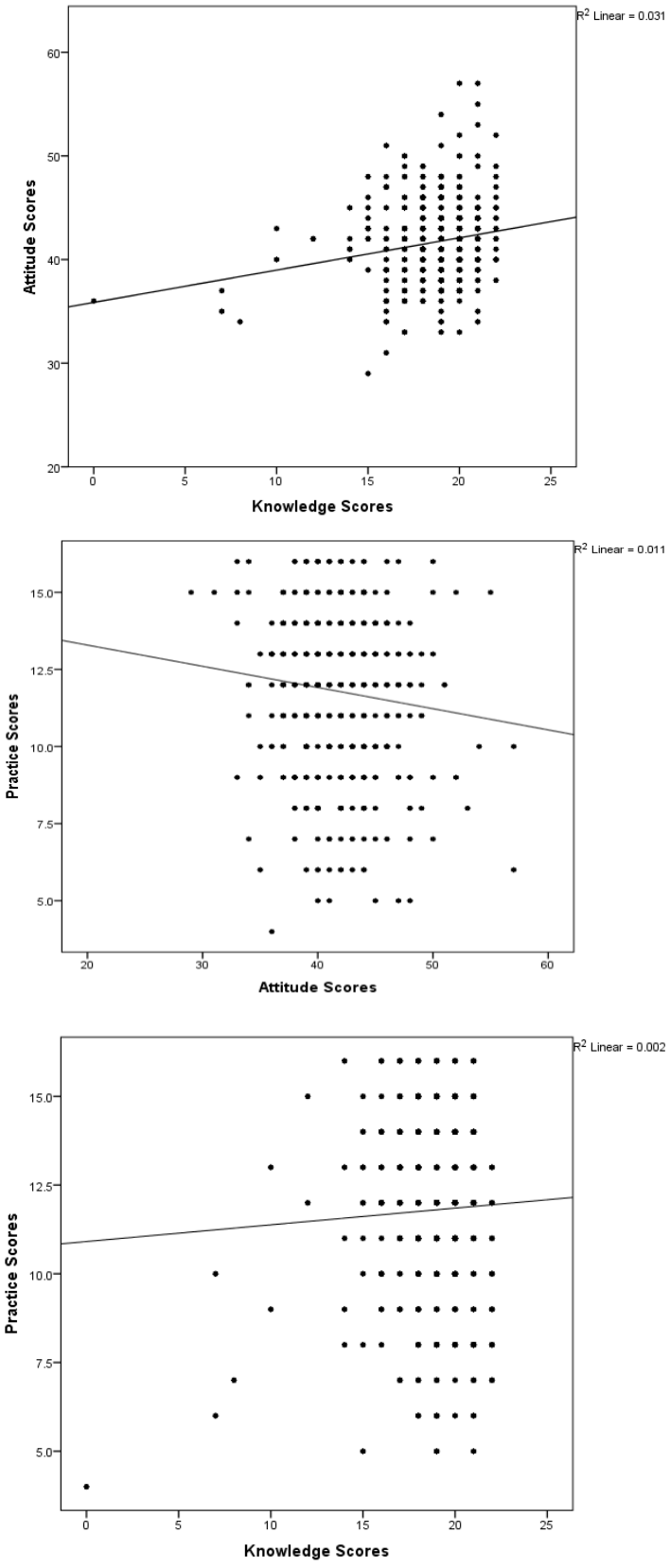


Figure 2: Correlations between knowledge scores, attitude scores and practice scores

Knowledge of COVID-19 was poorer among the rural respondents (β = -0.214; p-value<0.001) and non-medical respondents (β = -0.098 p value =0.038) than their reference group (urban and medical respondents respectively). The respondents with at least a college level of education (β = 0.109; p-value =0.015) had better knowledge of COVID-19 than school-only educated respondents. With regard to attitude, rural respondents had lower positive attitudes towards COVID-19 (β = -0.197; p-value <0.001) vis-à-vis their urban counterparts. Practice was more likely to be good amongst the older age groups (β = 0.232; p-value <0.001) and non-medical respondents (β = 0.127; p-value =0.006), and more likely to be poor among private sector respondents (β = -.096; p-value = 0.037) with statistically significant difference. The other independent KAP variables towards COVID-19 showed non-significant differences (See Table 7).

Table 7 Multiple linear regression between independent and dependent variables of study groups

Independent variables	Knowledge		Attitude		Practice	
	B (95% of CI)	Beta	B (95% of CI)	Beta	B (95% of CI)	Beta
Constant	19.555 (17.041, 22.070)		43.941 (39.472, 48.410)		8.731 (5.908, 11.553)	
Age groups (≤25, 26-50, ≥51)	-.149 (-.491, .193)	-.041	-.064 (-.672, .544)	-.010	.983 (.599, 1.367)	**.232****
Gender (Male:Female)	-.008 (-.410, .394)	-.002	-.473 (-1.188, .242)	-.061	.273 (-.179, .724)	.053
Residence (Urban:Rural)	-.945 (-1.335, -.555)	**-.214****	-1.533 (-2.225, -.840)	**-.197****	-.145 (-.583, .292)	-.028
Education (Elementary School, Higher School, College)	.689 (.134, 1.244)	.109*	.226 (-.760, 1.212)	.020	.190 (-.433, .813)	.026
Occupation (Government:Private)	-.052 (-.478, .373)	-.011	.460 (-.297, 1.216)	.057	-.508 (-.986, -.030)	**-.096***
Profession (Medical:Non-medical)	-.550 (-1.070, -.031)	**-.098***	-.258 (-1.182, .665)	-.026	.822 (.238, 1.405)	**.127***
Chronic Disease (Present:Absent)	-.051 (-.728, .626)	-.007	-.004 (-1.206, 1.199)	.000	-.132 (-.892, .627)	-.015

B= Unstandardized coefficient, Beta=Standardized Coefficients, CI= Confidence interval,
****p value<0.05=significant, ** p value< 0.05= highly significant, Reference category: First category***

DISCUSSION

This study assessed the level and determinants of KAP towards COVID-19. Given the threat imposed by COVID-19 and its nature of transmission, preventive measures play a critical role in reducing and controlling the spread of the disease. Public participation in adherence to preventive measures is crucial and this is affected by knowledge, attitude and practices (KAP) towards COVID-19. This becomes even more critical during unlocking and post-lockdown periods. Our study helps to identify gaps in KAP towards COVID-19 within the community.

In the present study, most of the respondents were female (61%) which suggests a lower interest from males in participating in the survey. This has also been observed in other research that has reported women engaging with surveys at a higher rate than men.[12-15] The findings of the present study indicates that the majority of respondents had good knowledge and attitudes towards COVID-19 but recorded more limited good practice of COVID-19 appropriate behaviour (though this was still high at 89%). The high ratio of correct responses related to knowledge and

attitude (well above 90% for most items) could be due to the background of the study population, the majority of whom were well educated, and the impact of continuous awareness drives by the Indian government. The study brought out that the persons with high knowledge are more likely to have a positive attitude and to observe correct practice towards preventive measures. Not everyone with a positive attitude follows the proper practice or adheres to preventive measures related to COVID-19, however, indicating that good attitude does not always translate into good practice. Good knowledge among respondents in this study was irrespective of age, in contrast to an Indonesian study in which residents' knowledge was correlated with age, as well as with their level of education (the latter was mirrored in this study).[14]

Our study identified a good level of knowledge (99%) but lower level of practice (89%) among medical students, whereas a study from Pakistan recorded medical students having only adequate knowledge (71.7%) but observed good practice (95.4%). Participants in the present study had a positive attitude (99%), similar to the Pakistan medical students (92.5%).[15] No influence of gender on knowledge and attitude was observed in the present study, however, females have been found to be more likely to observe good practice compared with male counterparts in other survey findings.[15,16] Knowledge, attitude and practice recorded among residents of Bangladesh was much lower than that recorded in the current study, i.e. 48.3%, 62.3%, 55.1%, respectively, [17] while among Chinese residents overall correct rate of knowledge has been recorded to be as high as 90%, which is much closer to our study.[18] We recorded good knowledge overall among the general public, close to the level of knowledge observed amongst healthcare workers in the same city of India.[19] Knowledge was closely associated with attitude and practice. The elderly, who are at the greatest risk for infection of COVID-19 – accounting for more than 95% of all deaths associated with it[20] along with subjects who have chronic diseases and low immunity[21] – were observed to be more likely to follow better practice than the younger age group in this study. Education is a key determinant for compliance with clear and actionable guidance for the prevention, early detection and control of COVID-19. The majority of respondents of the present study, most of whom were highly educated, urban residents and worked in the medical profession, had good levels of knowledge. Better information should be provided to rural areas through campaigns, and it is also important to target the less educated public, as in this study they are more likely to hold incorrect beliefs about the COVID-19 pandemic and how to prevent it. The present KAP study thus reiterates the need to provide correct and appropriately targeted information about COVID-19 spread, control and preventive measures, particularly to rural and less educated members of the public.

The strength of present study lies in its large sample size, recruited during the early stage of the COVID-19 pandemic. It was conducted during a period of lower severity of the pandemic, January to March 2021, before the second wave of COVID-19 in India. Our findings may help health authorities to plan preventive strategies for future events and a predicted third wave. Limitations of the study include that the data were self-reported, which might suffer from reporting bias. The online survey may under-represent or exclude vulnerable segments of society, such as the poor or rural residents due to insufficient access to information resources. KAP toward COVID-19 in vulnerable individuals needs more study.

CONCLUSION

The present study found that education is a key determinant in awareness of COVID-19, as rural and less educated people were less aware of COVID-19 characteristics, treatment and mechanisms of spread of disease and more prone to misunderstandings such as that the virus could be transmitted through dairy products and meat consumption, and the faecal-oral route. The urban public had a healthy attitude towards COVID-19 but this did not always translate into good practice towards quarantine, maintaining physical distance and using face masks. More than 89% reported they always wear a mask when leaving home, however, even though attitudes to this were generally negative. A concerning number of the study respondents did not believe that vaccination would help to elimination COVID-19, which warrants further

attention by public health authorities. Good practice was more likely to be followed by women, older people, government employees and participants from non-medical professions. Most respondents were likely to practice hand hygiene (89%) but fewer were likely to consume vitamin supplements and herbal powder recommended by the Government. Participants were lenient on visitors coming to their houses and were not very interested in using the Government-recommended Aarogya Setu App for contact tracing and receiving COVID-19 advice. Finally, the present study identified that people with a good level of knowledge were more likely to display a positive attitude and to observe good practice, but positive attitude among respondents did not always translate into good practice related to COVID-19.

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REFERENCES

1. World Health Organization. 2019-nCoV outbreak is an emergency of international concern. 2020. http://www.euro.who.int/en/health-topics/health-emergencies/international-health-regulations/news/news/2020/2/2019-ncov-outbreak-is-an-emergency-ofinternational-concern [cited on 2020 June 02]
2. Ruan S. Likelihood of survival of coronavirus disease 2019. Lancet Infect Dis 2020; 20(6): 630-631.
3. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 2020; 395: 507-513.
4. Hopkins J. Corona virus resource centre. Available from: https://coronavirus.jhu.edu/ [cited on 2021 December 27]
5. Government of India. #IndiaFightsCorona COVID-19. Available from: https://www.mygov.in/covid-19 [
6. World Health Organization- Advice for the public: Coronavirus disease (COVID-19) Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public [cited on 2021 October 1]
7. Chirwa GC. "Who knows more, and why?" Explaining socioeconomic-related inequality in knowledge about HIV in Malawi. Sci African 2020;7:e00213.
8. Chirwa GC, Sithole L, Jamu E. Socio-economic Inequality in Comprehensive Knowledge about HIV in Malawi. Malawi Med J 2019;31(2):104–11. doi: 10.4314/mmj.v31i2.1
9. Loannidis JPA. Coronavirus disease 2019: the harms of exaggerated information and non-evidence-based measures. Eur J Clin Invest 2020:e13223.
10. Survey tool and guidance: behavioral insights on COVID-19. 29 July 2020 (produced by the WHO European Region). Available from: https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19
11. Habersaat, Katrine B: Guidance and protocol, Questionnaire.Template.BI for COVID-19_Psycharchives, Rapid, simple, flexible, cost-effective behavioral insights on COVID-19. [cited on 2021 Februray 11]
12. Curtin R, Presser S, Singer E. The effects of response rate changes on the index of consumer sentiment. Public Opin Q 2000;64 (4):413–428. doi:10.1086/318638
13. Khaled A, Siddiqua A, Makki S. The knowledge and attitude of the community from the Aseer Region, Saudi Arabia, toward COVID-19 and their precautionary measures against the disease. Risk Manag Healthc Policy 2020;13:1825–1834. doi:10.2147/RMHP.S271899
14. Sulistyawati S et al. Knowledge, Attitudes, Practices and Information Needs During the COVID-19 Pandemic in Indonesia. Risk Manag Healthc Policy 2021 Jan 14;14:163-175. doi: 10.2147/rmhp.s288579.
15. Noreen K, et al Knowledge, attitudes, and practices against the growing threat of COVID-19 among medical students of Pakistan. PLoS ONE 2020;15(12): e0243696. https://doi.org/10.1371/ journal. pone.0243696
16. Al-Hanawi MK et al. Knowledge, Attitude & Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. Front Public Health 2020; 8: 217.
17. Ferdous MZ, Islam MS, Sikder MT, Mosaddek ASM, Zegarra-Valdivia JA, Gozal D. Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: An onlinebased cross-sectional study. PLoS ONE 2020;15(10): e0239254.
18. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. Int J Biol Sci. 2020; 16(10):1745-1752.
19. Rani M, Sharma I, Sharma S, Sharma L, Kumar S. Exploring the knowledge, attitude, and practice of health-care professionals on coronavirus (COVID-19) pandemic infection. J Edu Health Promot 2021;10:115.
20. WHO-Europe. Statement – older people are at highest risk from COVID-19, but all must act to prevent community spread. Available from: https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/statements/state ment-older-people-are-at-highest-risk-from-covid-19,-but-all-must-actto-prevent-community-spread. [cited on 2020 August 29]
21. Begley S. What explains Covid-19's lethality for the elderly? STAT. Available from: https://www.statnews.com/2020/03/30/what-explains-coronavirus-lethality-for-elderly/. [cited on 2020 August 29]