

# Knowledge, Attitude, and Practice of General Public Towards COVID-19 in India: An Online Cross-Sectional Study

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**ABSTRACT: Background:** Coronavirus disease 2019 (COVID-19) is a rapidly spreading infectious disease that had been announced pandemic by the World Health Organization. This study aims to measure the level of knowledge, attitude, and practice of the general public towards COVID-19 in India, and to detect the association with socio-demographic variables.

**Methods:** A cross-sectional study, conducted on the general population of India. A survey questionnaire included socio-demographic characteristics and 24 item questions on knowledge, attitude, practice towards Coronavirus disease 2019 (COVID-19). The questionnaire was made in both Hindi and English for a better understanding of participants. Data were collected online through survey forms and analyzed.

**Results:** The questionnaire was completed by 694 participants, 63.5% of the participants had good knowledge about COVID-19. Knowledge, attitude and practice scores were significantly similar for both males and females. Regarding the attitude, 74% of the participants had a positive attitude and 90% of the participants considered COVID-19 as a serious disease. 93.2% of the participants in our study had adopted practices to prevent COVID-19. Moreover, 99% of the participants followed social distancing in their daily routine.

**Conclusion:** The overall population had good knowledge, positive attitude, and have adopted the practices to prevent the disease during the pandemic. People with low knowledge about COVID-19 need to be targeted, to promote their positive attitude and to adopt safe practices.

**KEYWORDS:** COVID-19, Knowledge, Attitude, Practice, India.

## I. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by a novel strain of Coronavirus (2019-nCoV). During the end of December 2019, the initial cases of COVID-19 emerged in Wuhan City, Hubei Province of China [1]. The COVID-19 had spread rapidly from its origin in Wuhan, China to the rest of the world due to which the outbreak was declared public health emergency of international concern by the World Health Organization (WHO) on January 30th, 2020 [2]. There were 125,260 cases of COVID-19 around the world on March 12th, 2020 and the virus had reached 118 countries, and the WHO characterized this situation as a global pandemic [3]. As of June 14th, 2020, there were 7,553,182 confirmed cases in the world and 308,993 confirmed cases in India, and the death toll has reached 423,349 and 8,884 respectively [4]. India stands at the fourth position with the greatest number of confirmed cases so far [5].

COVID-19 is the first coronavirus after Spanish Flu (1918 to 1919), which has extremely influenced the health system, economy, and psychology of India [6]. The threat of COVID-19 is increasing day by day as the cases are not in control. Implementing personal hygiene and health behaviors are necessary to curb the spread of coronavirus, such as hand washing and social distancing [7]. Without sustained bans on large gatherings including large weddings, mass prayers, and funeral, these may create super-spreading events that accelerate transmission [8].

The recommended control measures need to be adopted by the citizens of India and its effectiveness is influenced by their knowledge, attitudes, and practices (KAP) towards COVID-19 as per KAP theory [9]. The time required for the development of vaccines is unknown, and thus control of this situation depends upon the effective implementation of control measures.

Lessons learned from the severe acute respiratory syndrome (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 further complicate attempts to prevent the spread of the disease [10]. Behaviors like underestimation, stigmatization, panic emotions, false measures to avoid infection affect the battle against such an uncommon situation [11].

The future course of this virus is unknown. In the initial stage of the pandemic, India reported some of the lowest infection rates of COVID-19. Numbers began to rise in late March 2020, with confirmed cases increasing across the country, however, this number may reflect a shortage of tests [12].

The present study aimed to measure the level of knowledge, attitude, and practice of the general public towards COVID-19 in India, and to detect the association with sociodemographic variables.

## II. METHODOLOGY

### Study design and Population:

This study was a web-based cross-sectional survey. The sample size was determined using the Epi Info 7 software. The sample size was estimated by assuming that the probability of having a good knowledge and positive attitude towards preventive measures against coronavirus disease was 50%, confidence level = 99%, and d (margin of error) = 5%. The calculated sample size of this study was 665 participants. The inclusion criteria consisted of participants of Indian nationality aged 18 years and above.

### Questionnaire preparation:

The questionnaire of this study was developed with the help of WHO training material for COVID-19 [13]. A 24-item survey questionnaire was prepared in both Hindi and English for a better understanding of the participants. The questionnaire was comprised of socio-demographic characteristics, knowledge regarding COVID-19, attitude towards COVID-19, and practice regarding the prevention of COVID-19. Socio-demographic characteristics included questions related to age, gender, marital status, education, employment status, income, and place of current residence. Place of residence was further compressed into five zones North zone, South zone, East zone, West zone, and Central zone.

### Knowledge about COVID-19:

The knowledge section of the questionnaire consisted of 13 questions (K1-K13): 6 questions regarding clinical presentations (K1-K6), 4 questions regarding prevention and control (K7-K10), and 3 questions regarding transmission routes (K11-K13) of COVID-19. A correct answer was assigned one point and an incorrect/unknown answer was assigned zero points. Thus, total knowledge scores ranged from 0 to 13, with a higher score denoting a better knowledge of COVID-19. Knowledge score was interpreted in terms of Good, Fair, and Poor, where a score of more than 10 denoted good knowledge, between 6 to 10, denoted fair knowledge, and less than 6 denoted poor knowledge.

### Attitude towards COVID-19:

To evaluate the attitude of the general public towards COVID-19, 4 questions were asked (A1-A4). The scoring was similar to the knowledge section. The total attitude score ranged from 0 to 4.

### Practice regarding COVID-19:

There were 7 questions related to practice (P1-P7) for the prevention of COVID-19. The scoring systems for practice were similar to the knowledge section. The total practice score ranged from 0 to 7. These questions were answered on the Yes/No basis.

### Data Collection:

Data was collected using Google Form and the link was distributed through the various social media platforms. Participants were encouraged to share the google form link with their friends and relatives. A short description of the study, voluntary participation, declaration of confidentiality, and anonymity were included at the beginning of the form. The data were collected from 23rd May to 1st June 2020 and the questionnaire was completed by 704 participants.

### Statistical Analysis:

Data were coded and recorded in the MS Excel spreadsheet program. For data analysis, Statistical Package for the Social Sciences (SPSS) software, version 23 (IBM Corp.) was used. Descriptive statistical methods were utilized to summarize data on socio-demographic characteristics and responses to the knowledge, attitude, and practice (KAP) questions towards COVID-19. Descriptive statistics were elaborated in the form of means/standard deviations and medians/Interquartile range (IQRs) for continuous variables, and frequencies and percentages for categorical variables.

Group comparisons for continuously distributed data were made using independent sample 't' test when comparing two groups. If data were found to be non-normally distributed, appropriate non-parametric tests in the form of the Wilcoxon test were used. A chi-square test was used for group comparisons for categorical data. In case the expected frequency in the contingency tables was found to be <5 for >25% of the cells, Fisher's Exact Test was used instead.

Linear correlation between two continuous variables was explored using Pearson's correlation (if the data were normally distributed) and Spearman's correlation (for non-normally distributed data). Statistical significance was kept at  $P < 0.05$ .



**Ethical Considerations:**

This study was approved by the ethics committee of the institution. Respondent’s anonymity and confidentiality were ensured. At the beginning of the questionnaire, consent was sought in terms of yes or no for willingness to participate.

**III. RESULTS**

The questionnaire was filled by 704 participants, out of which 10 participants did not consent to participate thus a final sample of the study was 694 participants. More than half of the participants (64.4%) were between 18 to 30 years of age. Distribution of participants based on gender was somewhat equal, for males and females i.e. 49.3% and 50.6% respectively. Over one-half of the participants were unmarried. The least number of responses were from the South and West zone of the country. (Table 4)

Table 1: Summary of knowledge, attitude and practice assessment on COVID-19 among the general population of India (n = 694)

Knowledge, Attitude and Practice Items	Frequency (%)	
	Correct	Incorrect
<b>K1.</b> Cause	649 (93.5%)	45 (6.5%)
<b>K2.</b> Incubation period	616 (88.8%)	78 (11.2%)
<b>K3.</b> Age group	628 (90.5%)	66 (9.5%)
<b>K4.</b> Symptoms	649 (93.5%)	45 (6.5%)
<b>K5.</b> Common cold, stuffy nose, runny nose, and sneezing are less common	367 (52.9%)	327 (47.1%)
<b>K6.</b> Elderly more susceptible	527 (75.9%)	167 (24.1%)
<b>K7.</b> Washing hands	613 (88.3%)	81 (11.7%)
<b>K8.</b> Medical masks	630 (90.8%)	64 (9.2%)
<b>K9.</b> Avoid going outside	676 (97.4%)	18 (2.6%)
<b>K10.</b> Isolation and treatment	654 (94.2%)	40 (5.8%)
<b>K11.</b> Transmission from contaminated dairy and meat	275 (39.6%)	419 (60.4%)
<b>K12.</b> Fever	544 (78.4%)	150 (21.6%)
<b>K13.</b> Spreads via respiratory droplets	622 (89.6%)	72 (10.4%)
<b>A1.</b> COVID-19 is serious disease	638 (91.9%)	56 (8.1%)
<b>A2.</b> Awareness is sufficient	384 (55.3%)	310 (44.7%)
<b>A3.</b> COVID-19 can be controlled?	428 (61.7%)	266 (38.3%)
<b>A4.</b> India can win against COVID-19	599 (86.3%)	95 (13.7%)
<b>P1.</b> Avoid going out	659 (95.0%)	35 (5.0%)
<b>P2.</b> Wear mask	677 (97.6%)	17 (2.4%)
<b>P3.</b> Avoid handshaking and hugging	679 (97.8%)	15 (2.2%)
<b>P4.</b> Frequently wash hands	675 (97.3%)	19 (2.7%)
<b>P5.</b> Use sanitizer and disinfectant	661 (95.2%)	33 (4.8%)
<b>P6.</b> Use traditional medicine	489 (70.5%)	205 (29.5%)
<b>P7.</b> Follow social distancing	687 (99.0%)	7 (1.0%)

**Knowledge outcome of COVID-19:**

The knowledge of participants was assessed by 13 questions on knowledge and the mean of total knowledge score was 10.73 (SD-1.82, Median-11.00) and Ranged from 10 to 12 (Table 2). More than 80% of the participants knew the cause, route of transmission, and susceptible age group of COVID 19. Common cold-like symptoms are less common was not known to 47% of the participants. The results suggested that 60.4% of the participants thought that contaminated dairy and meat can cause the transmission of COVID-19 (Table 1).

The knowledge score interpretation was done in terms of good, fair and poor and the study results suggested that the mean for good knowledge score was 11.78 ranged from 11 to 12, for fair mean was 9.23 ranged from 9-10, for poor mean was 3 which ranged from 2-5 (Table 3). Distribution of the Participants in Terms of Knowledge Score Interpretation can suggest that more than half of the participants (63.5%) had good knowledge though a very small proportion of participants which is 1.9% had poor knowledge.

Table 2: Total Scores of Knowledge, Attitude, and Practice about COVID-19 among the general population of India in terms of Mean, Median, and Range.

KAP Total Scores	Mean ± SD	Median (IQR)	Min- Max
<b>K Score Total</b>	10.73 ± 1.82	11.00 (10.00-12.00)	0.0 - 13.0
<b>A Score Total</b>	2.95 ± 0.98	3.00 (2.00-4.00)	0.0 - 4.0
<b>P Score Total</b>	6.52 ± 0.89	7.00 (6.00-7.00)	0.0 - 7.0

\*IQR- Interquartile Range



Table 3: Level of knowledge about COVID-19 disease among the general population of India (n = 694)

K Score Total	K Score Interpretation			Kruskal Wallis Test	
	Good	Fair	Poor	X <sup>2</sup>	p-value
Mean (SD)	11.78 (0.72)	9.23 (0.97)	3.00 (2.00)	509.336	<0.001
Median (IQR)	12 (11-12)	10 (9-10)	4 (2-5)		
Range	11 - 13	6 - 10	0 - 5		

\*X<sup>2</sup>- Chi-square

Knowledge scores varied significantly across age, gender, marital status, education, employment status, income, and region. The study results suggested that the socio-demographic variables such as gender, education, employment status, monthly family income, region were significantly associated (p<0.05) with knowledge. However, marital status does not have a significant correlation (Table 4).

Table 4: Correlation of socio-demographics and the knowledge about COVID-19 among the general population of India (n= 694)

Socio-Demographics	Frequency (%)	Mean ± Standard deviation					
		K Score Total	p-value	A Score Total	p-value	P Score Total	p-value
<b>Age</b>			0.143 <sup>1</sup>		0.837 <sup>1</sup>		0.060 <sup>1</sup>
18-30 years	447 (64.4%)	10.78 ± 1.58		2.95 ± 0.98		6.53 ± 0.79	
31-40 years	61 (8.8%)	10.92 ± 1.78		2.98 ± 0.87		6.82 ± 0.39	
41-50 years	70 (10.1%)	10.91 ± 2.16		3.01 ± 1.04		6.40 ± 1.16	
51-60 years	81 (11.7%)	10.46 ± 2.54		2.85 ± 1.07		6.44 ± 1.16	
Above 60 years	35 (5.0%)	10.17 ± 2.01		3.09 ± 0.82		6.34 ± 1.26	
<b>Gender</b>			0.015 <sup>1</sup>		0.441 <sup>1</sup>		0.075 <sup>1</sup>
Male	342 (49.3%)	10.92 ± 1.65		2.92 ± 0.96		6.49 ± 0.84	
Female	351 (50.6%)	10.56 ± 1.96		2.99 ± 1.00		6.55 ± 0.94	
Transgender	1 (0.1%)	9.00 ± 0		3.00 ± 0		7.00 ± 0	
<b>Marital Status</b>			0.065 <sup>1</sup>		0.178 <sup>1</sup>		0.003 <sup>1</sup>
Unmarried	430 (62.0%)	10.72 ± 1.59		2.97 ± 0.97		6.53 ± 0.77	
Married	250 (36.0%)	10.88 ± 1.94		2.97 ± 0.97		6.58 ± 0.90	
Divorcee/separated	7 (1.0%)	8.43 ± 5.16		2.00 ± 1.53		5.86 ± 2.04	
Widow/widower	7 (1.0%)	8.86 ± 3.24		2.57 ± 0.98		4.43 ± 2.44	
<b>Education</b>			<0.001 <sup>1</sup>		0.006 <sup>1</sup>		0.064 <sup>1</sup>
Illiterate	2 (0.3%)	9.50 ± 0.71		4.00 ± 0.00		7.00 ± 0.00	
Primary school	1 (0.1%)	9.00 ± 0		2.00 ± 0		5.00 ± 0	
Middle school	12 (1.7%)	8.83 ± 1.34		3.33 ± 0.65		6.33 ± 1.15	
High school	15 (2.2%)	9.40 ± 3.00		2.93 ± 1.16		6.53 ± 1.30	
Intermediate	44 (6.3%)	10.00 ± 2.84		2.43 ± 1.15		6.11 ± 1.35	
Graduate or Postgraduate	620 (89.3%)	10.86 ± 1.66		2.98 ± 0.95		6.56 ± 0.83	
<b>Employment Status</b>			0.027 <sup>1</sup>		0.059 <sup>1</sup>		0.755 <sup>1</sup>
Employed	306 (44%)	10.99 ± 1.68		2.94 ± 0.88		6.55 ± 0.82	
Student	269 (38.8%)	10.64 ± 1.56		3.05 ± 1.00		6.51 ± 0.84	
Unemployed	65 (9.4%)	10.26 ± 2.65		2.71 ± 1.20		6.46 ± 1.16	
Homemaker	34 (4.9%)	10.32 ± 2.45		2.68 ± 1.09		6.56 ± 1.02	
Retired	20 (2.9%)	10.40 ± 2.35		3.00 ± 0.79		6.35 ± 1.39	
<b>Monthly Family Income</b>			0.004 <sup>1</sup>		0.147 <sup>1</sup>		0.177 <sup>1</sup>
<Rs 2,600	39 (5.6%)	10.00 ± 0		4.00 ± 0		7.00 ± 0	
Rs 2,601-7,800	21 (3.0%)	10.26 ± 2.00		2.85 ± 1.27		6.64 ± 0.90	
Rs 7,801-13,000	29 (4.2%)	10.57 ± 0.93		3.43 ± 0.68		6.86 ± 0.48	
Rs 13,001-19,000	31 (4.5%)	11.00 ± 1.41		3.03 ± 0.98		6.66 ± 0.55	
Rs 19,001-26,000	78 (11.2%)	9.87 ± 2.25		2.71 ± 1.07		6.52 ± 0.96	
Rs 26,001- 52,000	178 (25.6%)	10.15 ± 2.72		3.05 ± 1.08		6.45 ± 1.26	
>Rs 52,001	318 (45.8%)	10.88 ± 1.61		2.97 ± 0.86		6.49 ± 0.93	
<b>Region</b>			0.001 <sup>1</sup>		<0.001 <sup>1</sup>		<0.001 <sup>1</sup>
North Zone	393 (56.6%)	10.92 ± 1.61		2.92 ± 0.97		6.51 ± 0.80	
East Zone	154 (22.2%)	10.88 ± 1.75		2.81 ± 0.97		6.48 ± 0.84	
Central Zone	104 (15.0%)	10.23 ± 2.09		3.27 ± 0.94		6.57 ± 1.00	
West Zone	22 (3.2%)	10.88 ± 1.27		3.18 ± 0.86		6.81 ± 0.50	
South Zone	21 (3.0%)	11.27 ± 1.55		2.77 ± 0.92		6.45 ± 1.10	

\*\*\*Significant at p<0.05, 1: Kruskal Wallis Test, 2: Spearman Correlation

Good knowledge was persistent among all the age groups. Furthermore, poor knowledge was seen among participants of 18 to 30 years of age. Male had better knowledge than females on COVID-19 in India. Most of the participants who were graduate or postgraduate, had good knowledge whereas participants with illiterate to intermediate education background had fair knowledge. Most of the participants were employed and had better knowledge. There was a significant difference between the knowledge score interpretation in terms of K Score Total ( $X^2 = 509.336$ ,  $p = <0.001$ ), with the median K Score Total being highest in the K Score Interpretation for Good knowledge (Table 5).

Table 5: Association between knowledge score interpretation and socio-demographics about COVID-19 disease among the general population of India (n=694)

Parameters	Knowledge Score Interpretation			p-value
	Good (n = 441)	Fair (n = 240)	Poor (n = 13)	
<b>Age***</b>				0.014 <sup>1</sup>
18-30 years	277 (62.8%)	166 (69.2%)	4 (30.8%)	
31-40 years	47 (10.7%)	12 (5.0%)	2 (15.4%)	
41-50 years	49 (11.1%)	19 (7.9%)	2 (15.4%)	
51-60 years	51 (11.6%)	26 (10.8%)	4 (30.8%)	
Above 60 years	17 (3.9%)	17 (7.1%)	1 (7.7%)	
<b>Gender***</b>				0.016 <sup>2</sup>
Male	235 (53.3%)	103 (42.9%)	4 (30.8%)	
Female	206 (46.7%)	136 (56.7%)	9 (69.2%)	
Transgender	0 (0.0%)	1 (0.4%)	0 (0.0%)	
<b>Marital Status***</b>				<0.001 <sup>2</sup>
Unmarried	260 (59.0%)	167 (69.6%)	3 (23.1%)	
Married	174 (39.5%)	69 (28.7%)	7 (53.8%)	
Divorcee/separated	4 (0.9%)	1 (0.4%)	2 (15.4%)	
Widow/widower	3 (0.7%)	3 (1.2%)	1 (7.7%)	
<b>Education***</b>				<0.001 <sup>2</sup>
Illiterate	0 (0.0%)	2 (0.8%)	0 (0.0%)	
Primary school	0 (0.0%)	1 (0.4%)	0 (0.0%)	
Middle school	1 (0.2%)	11 (4.6%)	0 (0.0%)	
High school	6 (1.4%)	8 (3.3%)	1 (7.7%)	
Intermediate	23 (5.2%)	18 (7.5%)	3 (23.1%)	
Graduate or Post graduate	411 (93.2%)	200 (83.3%)	9 (69.2%)	
<b>Employment Status***</b>				<0.001 <sup>1</sup>
Employed	217 (49.2%)	85 (35.4%)	4 (30.8%)	
Student	151 (34.2%)	117 (48.8%)	1 (7.7%)	
Unemployed	39 (8.8%)	21 (8.8%)	5 (38.5%)	
Homemaker	21 (4.8%)	11 (4.6%)	2 (15.4%)	
Retired	13 (2.9%)	6 (2.5%)	1 (7.7%)	
<b>Monthly Family Income***</b>				<0.001 <sup>1</sup>
<Rs 2,600	18 (4.1%)	20 (8.3%)	1 (7.7%)	
Rs 2,601-7,800	12 (2.7%)	9 (3.8%)	0 (0.0%)	
Rs 7,801-13,000	18 (4.1%)	11 (4.6%)	0 (0.0%)	
Rs 13,001-19,000	13 (2.9%)	17 (7.1%)	1 (7.7%)	
Rs 19,001-26,000	46 (10.4%)	25 (10.4%)	7 (53.8%)	
Rs 26,001- 52,000	121 (27.4%)	56 (23.3%)	1 (7.7%)	
>Rs 52,001	213 (48.3%)	102 (42.5%)	3 (23.1%)	
<b>Region***</b>				0.005 <sup>1</sup>
North Zone	261 (59.2%)	126 (52.5%)	6 (46.2%)	
East Zone	81 (18.4%)	68 (28.3%)	5 (38.5%)	
Central Zone	67 (15.2%)	37 (15.4%)	0 (0.0%)	
West Zone	17 (3.9%)	5 (2.1%)	0 (0.0%)	
South Zone	15 (3.4%)	4 (1.7%)	2 (15.4%)	

\*\*\*Significant at  $p < 0.05$ , 1: Chi-Squared Test, 2: Fisher's Exact Test, 3: Kruskal Wallis Test



**Attitude outcome of COVID-19:**

The summary of attitude assessment on COVID-19 among the general population in India is shown in Table 1 which suggests that more than ninety percent of the participants considered COVID-19 as a serious disease. Participants showed a positive attitude regarding control of COVID-19 in the country. The results suggested that 44.7% of the participants' belief that awareness regarding COVID-19 is not sufficient in the society. The attitude of participants was assessed by 4 questions on attitude and the range of attitude score total was 2 to 4 and the mean was 2.95 (SD-0.98, Median-3.00) (Table 2). Attitude scores varied significantly across age, gender, marital status, education, employment status, income, and region. Though the attitude of participants towards COVID-19 was significantly associated ( $p < 0.05$ ) with the education and region (Table 4).

**Practice outcome of COVID-19:**

The summary of practice assessment on COVID-19 among the general population in India is shown in Table 1. The participants suggested that they have adopted good hygiene practices from wearing a mask to frequent washing of hand. The study results suggested that ninety-nine percent (99%) of the participants followed social distancing in their daily life. A little proportion of participants (29.5%) did not consume any herbal products and traditional medicine to boost their immunity. The practice of participants was assessed by 7 questions on practice and the mean of practice score total was 6.52 (SD-0.89, Median-7.00) and Ranged from 6 to 7 (Table 2). Practice scores varied significantly across age, gender, marital status, education, employment status, income, and region. Though the Practice of participants towards COVID-19 was significantly associated ( $p < 0.05$ ) with marital status and region. (Table 4)

The correlation among Knowledge, Attitude, and Practice of the general population in India can be seen in Figure 1. The scatterplot of Attitude vs Knowledge (I) and Knowledge vs Attitude (III) depicts a weak negative correlation whereas the scatterplot of Practice vs Knowledge (II), Practice vs Attitude (IV), Knowledge vs Practice (V), and Attitude vs Practice (VI) depict a weak positive correlation. The scatterplot of Practice vs Attitude (IV) and Attitude vs Practice (VI) showed that the correlation was statistically significant ( $\rho = 0.24$ ,  $p = < 0.001$ ).

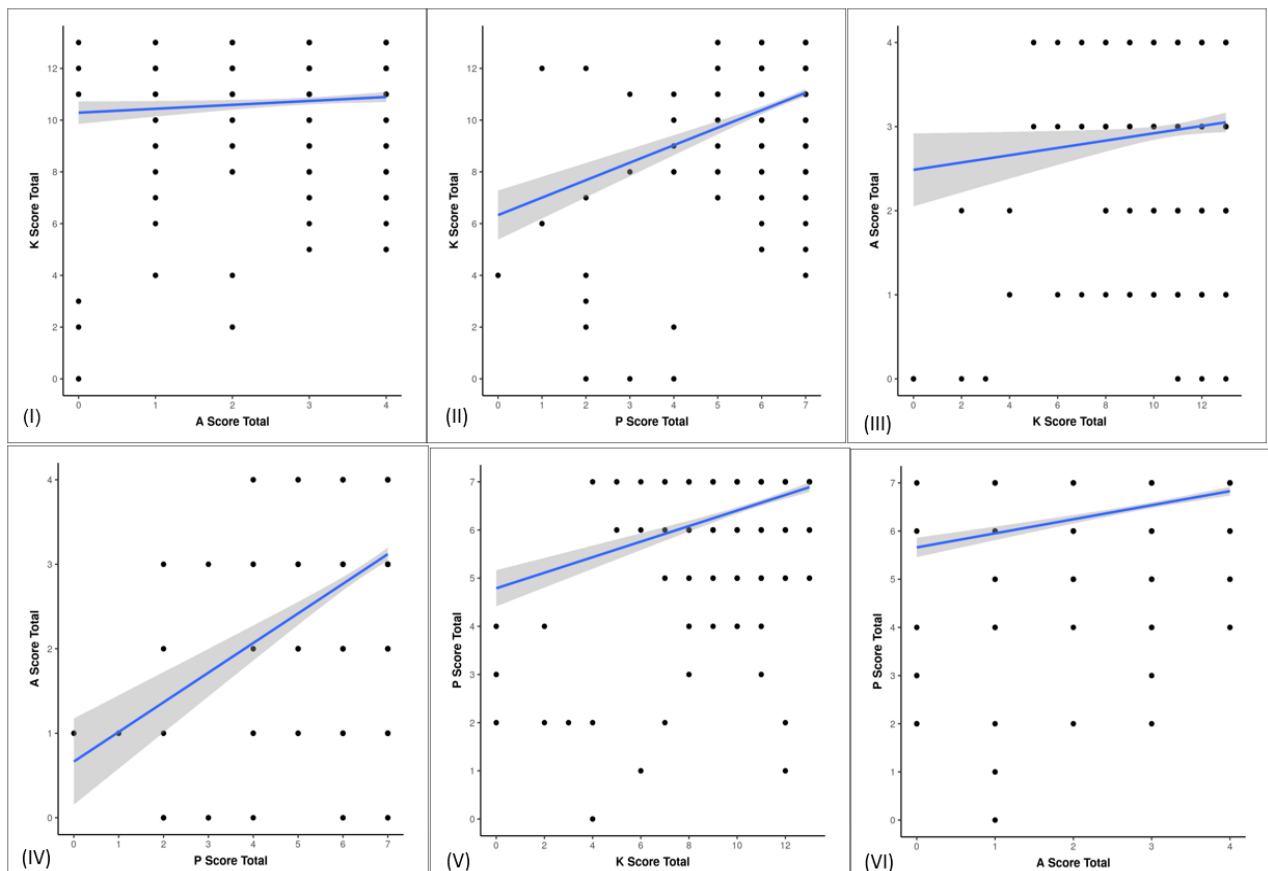


Figure 1- Scatter plot correlation among Knowledge (K), Attitude (A), and Practice (P) of the general population in India: (I): A vs K, (II): P vs K, (III): K vs A, (IV): P vs A, (V): K vs P, (VI): A vs P

#### IV. DISCUSSION

India is the second most populated country in the world [14], thus a large number of citizens are at greater risk of transmission and mortality by COVID-19 in India. Particularly among the elderly and those with chronic ailments. Worldwide efforts to stop the spread of the virus have been made. These efforts are based on the general public's understanding of the disease, which is mainly regulated by their knowledge and attitude. Taking this into account it was necessary to know the level of knowledge among citizens about COVID-19, their attitude towards COVID-19, and the practice they have adopted to prevent themselves from getting infected, all these aspects are covered in our study. As of 21 June 2020, lockdown in India is only constrained to containment zone so to prevent the upsurge of COVID-19 cases it is necessary that citizens have good knowledge and attitude, and bring it to their practices of daily life.

In view of our findings, the correct rate of 83% on the knowledge questionnaire suggested that most participants were well-informed about COVID-19. Our scores were a bit similar to a study conducted in Iran [15]. The high correct rate for COVID-19 information in the general population of India is may be due to the high availability of government-provided information about the virus since the outbreak began. Another reason is that 89.3% of participants were graduates. Scores were significantly equal for both males and females; this was contrary to a study conducted in China<sup>11</sup> which showed that females were more knowledgeable about COVID-19. Educated and married had significantly higher knowledge scores. In our study, most of the participants (93.5%) knew the causative agent, 97.5% of the participants knew about the prevention and control required, and 90.5% of the participants knew about the susceptible age group for COVID 19.

Participants in the study, exhibit good KAP towards COVID-19, compared to a study conducted in Thailand on the bordered population during the early outbreak period[16]. In Thailand, 73.4% had poor knowledge of disease prevention and control, while in our study only 1.9% of the participants had poor knowledge moreover 28.5% had poor attitudes toward the disease, while in our study 26.2% had poor attitudes. The main reason for these differences can be due to the difference in time of the study conducted. Our study was conducted when cases were rising and initiatives by the government were taken to increase awareness of the population, while in Thailand study was conducted during the early outbreak period when the number of cases was not that high.

Regarding attitudes, participants had a positive attitude towards the control of COVID-19 in the country and 90% of the participants considered COVID-19 as a serious disease. The attitude score of the participants was 74%. Interestingly our study suggests that females had better attitude scores than males. Though participants believed that awareness regarding COVID-19 is not sufficient in society, this may be due to the increasing number of COVID-19 cases in the country. The attitude of participants was significantly associated with education and region. Comparatively 61.7% of the participants admit that COVID-19 cannot be controlled in India this is contrary to the study conducted in Tanzania on KAP towards COVID-19 where 96% of the participants had an attitude that COVID-19 can be controlled in their country[17]. Our study suggested that attitude and practice are correlated which means a positive attitude will lead to positive practices by the citizen.

Regarding practice, 93.2% of the participants in our study have adopted preventive measures to control COVID-19. Moreover, our study suggests that participants wear a mask (97.6%), frequently wash hands (97.3%), avoid handshaking and hugging (97.8%), and avoid going out (95%). Thus, this suggests that the citizens of India have adopted major practices to prevent the contraction of the virus. Participants in the age group of 31 to 40 had better practice scores than participants of other age groups. A study conducted in Bangladesh on KAP of COVID-19 showed that 87.97% of participants followed social distancing in their daily routine Interestingly, in our study, 99% of the participants followed social distancing in their daily routine[18]. Even social distancing is an effective measure to control the spread of the disease and to limit the cases of COVID-19 in the country. Moreover, our study also suggested that knowledge was highly associated with the practice of participants thus the citizens of the country adopted social distancing and it was considered an effective measure to halt the cases of the disease in the country. A paper suggested that traditional medicine from Homeopathy and Ayurveda are immunity boosters to fight against coronavirus disease [19]. Certainly, in our study, 70.5% of the participants consume Herbal products and traditional medicines to boost their immunity. Experts have said that resurgence of COVID 19 cases may take place following the relaxation implemented for lockdown. To prevent this, the practices need to be instilled in the citizen [20]. The major limitation of this study is that the survey was restricted to people with internet access.

Our study concludes that the overall population had good knowledge, positive attitude, and adopted the practices to prevent the disease during the pandemic. Furthermore, males tend to be superior in knowledge in contrast females tend to be superior in attitude and practice. People with low knowledge about COVID-19 need to be targeted, in order to promote their positive attitude and to adopt safe practices. The government should create tools to increase awareness and adoption of safe practices during this hard time.

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