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Knowledge, attitude, and practice regarding COVID-19 among COVID-19 patients and their correlation with the outcomes: A cross-sectional study

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ABSTRACT

Objective: To assess the knowledge, attitude, and practice (KAP) regarding COVID-19 among COVID-19 patients and their relation with the outcomes.

Methods: This cross-sectional study was carried out among COVID-19 patients (18-year-old or older) consecutively admitted to a dedicated COVID-19 hospital located in northwest Rajasthan, India. Data regarding socio-demographic parameters, KAP, and primary composite outcome (admission to intensive care unit, mechanical ventilation, or in-hospital death) were collected. KAP scores were compared between different demographic variables and primary composite outcomes. Association between different demographic variables, primary composite outcomes, and KAP scores were determined through multivariate linear regression. Besides, the correlation among KAP scores was analyzed.

Results: Out of the total 222 patients, most of them (65.76%) had average KAP scores towards COVID-19. The mean scores for knowledge were 7.88, with an overall correct rate of 71.63%; the mean attitude scores were 2.42, with an overall correct rate of 60.50%; the mean practice scores were 5.12, with an overall correct rate of 64.00%. Patients who met the primary composite outcomes had higher knowledge scores, but lower attitude and practice scores. The result showed a significant positive correlation between the level of education, socioeconomic class, and knowledge, attitude, and practice towards COVID-19. Knowledge towards COVID-19 was significantly associated with a positive attitude and good practice.

Conclusions: Our findings show that adult COVID-19 patients have average KAP towards COVID-19 among COVID-19 patients. Poor attitude and practice towards COVID-19 are associated with adverse outcomes, so it is suggested to strengthen attitude and practice towards COVID-19 to improve the outcomes.

KEYWORDS: Knowledge; Attitude; Practice; COVID-19; Outcome; Rajasthan

1. Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the etiological agent of Corona Virus Disease 2019 (COVID-19) was first detected in 2019 and rapidly swept through the whole world. It was declared as a pandemic on 12th March 2020 by the World Health Organization[1,2]. In India, the first case of COVID-19 infection was reported on January 30th, 2020, from Kerala[3]. As of June 24th, 2021, 30 082 778 cases of COVID-19 have been reported, and 391 981 patients have succumbed to death[4].

Significance

Good knowledge, attitude, and practices are important for prevention and management of diseases. KAP towards COVID-19 was average among the study population. Outcomes of the COVID-19 are adversely affected by good knowledge, poor attitude and practice regarding COVID-19. Stress in patients with more knowledge about COVID-19 may contribute to poor outcomes.

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The disease is highly infectious, and it has a wide spectrum of clinical manifestations ranging from asymptomatic to acute severe respiratory distress[5].

To introduce effective control measures, knowledge about basic hygiene and the transmission of diseases is of vital importance. To fight against the ongoing COVID-19 pandemic, people's commitment to the control measures is of paramount importance. The commitment is generally affected by their knowledge, attitude, and practices towards the disease[6,7]. One of the most important measures to control the disease is public health education[8]. Contrastingly, knowledge and attitudes towards diseases may be associated with panic among the people, which can further hinder the efforts to contain the disease spread[9,10].

To expedite the management of the COVID-19 pandemic in India, there is an urgent need to know the awareness of the public towards COVID-19. In this study, we planned to evaluate the knowledge, attitude, and practice (KAP) towards COVID-19 among COVID-19 patients during the peak of the first wave of the COVID-19 outbreak in India and their correlation with the outcomes.

2. Patients and methods

2.1. Study design and patients

This cross-sectional descriptive study was carried out at a dedicated COVID-19 hospital, a tertiary health care center, affiliated to SP Medical College, Bikaner (Rajasthan). The period of the study is from October to November 2020. A total of 222 consecutive adult COVID-19 patients (>18 years) confirmed by RT-PCR were included in the study. A sample size of 110 was calculated assuming a frequency of 50% with a permissible error of 20% using the statistical formula, $n= 4pq/L^2$ (p: Prevalence; q: 100−p; L: Permissible error).

2.2. Ethical approval

The study is approved by the Institutional Ethics and Research Board of SP Medical College, Bikaner (Rajasthan) India [No: F. 29 (Acad) SPMC/2021/1476]. Written informed consent was taken from each participant.

2.3. Inclusion criteria

This study included all consecutive COVID-19 adult patients equal to or more than 18-year-old admitted to the dedicated COVID-19 hospital, who have given consent to be a part of the study.

2.4. Exclusion criteria

Patients age <18 years, those who have not given consent, and those who were not responded to questionnaires were excluded from the study.

2.5. Data collection

This study was conducted through personal interviews. The details of the study questionnaire were thoroughly explained. Data regarding socio-demographic parameters, KAP, and outcomes were collected from each participant.

2.5.1. Socio–demographic information

Socio-demographic information included age, gender, religion, residential area (urban, rural), education (illiterate, primary, high school, graduate), occupation (healthcare-related, non-healthcare-related), and socioeconomic status. Modified BG Prasad scale was used to measure the socioeconomic status and classified the status into five classes. Class Ⅰ, Ⅱ, Ⅲ, Ⅳ, and Ⅴ are defined by per capita monthly income in Rs: ≥6 574, 3 287-6 573, 1 972-3 286, 986-1 971, and ≤985, respectively[11].

2.5.2. Study outcomes

The primary composite outcomes include admission to an intensive care unit, the requirement of mechanical ventilation, and in-hospital death.

2.5.3. KAP Questionnaire

The questionnaire regarding KAP towards COVID-19 was derived from published literature[12-15]. The KAP questionnaire comprised 11, 4, and 8 questions regarding knowledge, attitude, and practice, respectively. The responses to the questions for knowledge and attitude were true, false, and "don't know". The true response was given 1 point and false/don't know responses were given 0 points. Questions related to practice towards COVID-19 were assigned with only two options of 'Yes' and 'No'. Poor, average, and good KAP corresponded to scores of less than $\mu-1\sigma$, $\mu\pm1\sigma$, and more than $\mu+1\sigma$, respectively. Cronbach's alpha coefficient is 0.85 of questionnaires in this study.

2.6. Statistical analysis

Statistical software SPSS 16.0 was used to analyze the data. Data were presented as mean, standard deviation, and proportion as applicable. ANOVA and Student's t-test were used to compare between different groups. To determine the association between demographic variables, and primary composite outcomes related to COVID-19 and KAP, multiple linear regression was used. To measure the association among KAP, Pearson's correlation coefficient was used. The significant level of this study was set at $\alpha=0.05$.

3. Results

3.1. Demographic characteristics

Out of the 222 participants, 77.48% were males; the majority of them were in 51-70 years age group; 96.4% of the participants

were 'Hindu' while only 3.6% were 'Muslim' regarding religions; The majority of them (96.40%) were from the urban area; 55.86% were graduates; The majority of them (82.88%) have occupations not related to healthcare; The majority of them (76.58%) were in high socioeconomic status.

3.2. Knowledge

The KAP scores are shown in Table 1. Almost 93.7% of patients had correctly answered the questions about COVID-19 symptoms. Besides this, 78.4% of the patients agreed that symptomatic treatment in the early stage leads to recovery from the infection in most cases. The majority of the patients had correctly answered the question related to knowledge about the routes of transmission, although, more than half of the patients (51.4%) agreed that eating or contact with infected animals would not result in the infection by the COVID-19 virus. The majority of the patients (64.0%) were aware that COVID-19 transmission can be prevented by wearing surgical masks in the general population. The majority of patients (74.8%) agreed that COVID-19 can be prevented by avoiding crowded places and taking public transportation. Besides, 76.6% of patients knew isolation for 14 d if people have contact with COVID-19 infected person. Overall, 63.06% of patients had average, 25.23% patients had poor and 11.71% had good knowledge about COVID-19. The mean knowledge scores were 7.88, suggesting an overall correct rate of 71.63% for knowledge (Table 2).

Table 1. Results of the knowledge, attitude, and practice about COVID-19 (n=222).

Questionnaires	True, *n* (%)	False, *n* (%)	Don't know, *n* (%)
Knowledge questionnaires			
K1. The symptoms of COVID-19 are fever, sore throat, dry cough, fatigue and body ache, *etc*.	208 (93.7)	6 (2.7)	8 (3.6)
K2. Symptomatic treatment in the early-stage leads to recovery from the infection in most cases.	174 (78.4)	28 (12.6)	20 (9.0)
K3. COVID-19 patients with old age, having obesity and chronic illnesses have more chances to develop severe disease.	160 (72.1)	34 (15.3)	28 (12.6)
K4. COVID-19 infection would not occur by eating or contact with animals.	114 (51.4)	52 (23.4)	56 (25.2)
K5. COVID-19 infection can be transmitted from asymptomatic individuals.	146 (65.8)	32 (14.4)	44 (19.8)
K6. COVID-19 virus can be transmitted *via* respiratory droplets of a person infected with COVID-19.	154 (69.4)	28 (12.6)	40 (18.0)
K7. COVID-19 virus can be prevented by wearing surgical masks in the general population.	142 (64.0)	54 (24.3)	26 (11.7)
K8. Young adults and children should take extra precautions to prevent the spread of infection by the COVID-19 virus.	166 (74.8)	30 (13.5)	26 (11.7)
K9. COVID-19 can be prevented by avoiding crowded places and taking public transportation.	166 (74.8)	22 (9.9)	34 (15.3)
K10. Early treatment and isolation of COVID-19 patients can prevent the spread of infection.	152 (68.5)	50 (22.5)	20 (9.0)
K11. Contact with COVID-19 patients should be isolated for 14 days.	170 (76.6)	34 (15.3)	18 (8.1)
Attitude questionnaires			
A1. Media coverage (*e.g.* television, newspaper, and internet) gives much exposure to COVID-19 related news?	178 (80.2)	16 (7.2)	28 (12.6)
A2. "Janta Curfew" will be effective to prevent the spread of the COVID-19?	144 (64.9)	48 (21.6)	30 (13.5)
A3. Lockdown of major cities will help to control the COVID-19?	130 (58.6)	54 (24.3)	38 (17.1)
A4. The COVID-19 virus will be ultimately controlled?	106 (47.7)	74 (18.9)	42 (18.9)
Practices questionnaires	**Yes, *n* (%)**	**No, *n* (%)**	-
P1. Did you wash hands more frequently after the COVID-19 outbreak?	186 (83.8)	36 (16.2)	-
P2. Did you use hand sanitizer more frequently after the COVID-19 outbreak?	146 (65.8)	76 (34.2)	-
P3. Did you use personal protective equipment (*e.g.* mask) more often than previously after the COVID-19 outbreak?	146 (65.8)	76 (34.2)	-
P4. Did you keep hand sanitizer along with after the COVID-19 outbreak?	126 (56.8)	96 (43.2)	-
P5. Did you save the emergency helpline number to contact if you or your relative had the COVID-19 virus?	110 (49.5)	112 (50.5)	-
P6. Did you keep social distancing during the COVID-19 outbreak?	130 (58.6)	92 (41.4)	-
P7. Did you use a handkerchief while coughing and sneezing during the COVID-19 outbreak?	148 (66.7)	74 (33.3)	
P8. Did you avoid casual travel and outing during the outbreak?	168 (75.7)	54 (24.3)	-

3.3. Attitude

The majority of patients (80.2%) accepted that media coverage (*e.g.* television, newspaper, and internet) gives much exposure to COVID-19 related news. Furthermore, the majority of the patients (64.9%) were in favor of Janta Curfew, and almost half supported the lockdown of the major cities and agreed that the COVID-19 virus will be ultimately controlled. Overall, 66.66% of the patients had average, 25.23% of the patients had poor and 8.11% had a good attitude regarding COVID-19. The mean attitude scores were 2.42, suggesting an overall correct rate of 60.50% for attitude (Table 2).

3.4. Practice

The majority of patients used to wash their hands (83.8%) and avoided outing or casual travel (75.7%) during the outbreak. More than half of the patients used hand sanitizer and mask and used handkerchiefs during coughing and sneezing during the outbreak. Besides, 58.6% of the patients maintained social distance during the outbreak, and 49.5% used to keep emergency helpline numbers. Overall, 57.65 % of the patients had average, 26.13% of the patients had poor and 16.22% had good practice regarding COVID-19. The mean practice scores were 5.12, suggesting an overall correct rate of 64.00% for practice (Table 2).

3.5. Analysis of KAP scores concerning demographic variables and outcome

Comparison of KAP scores of COVID-19 concerning demographic variables and the primary composite outcomes are shown in Table 3.

Table 2. Knowledge, attitude, and practice scores about COVID-19 in COVID-19 patients.

Variables	Range of scores	Total scores (Mean± SD)	Level, *n* (%)		
			Poor (<$\mu-1\sigma$)	Average ($\mu\pm1\sigma$)	Good (>$\mu+1\sigma$)
Knowledge	2-11	7.88±2.67	56 (25.23)	140 (63.06)	26 (11.71)
Attitude	0-4	2.42±0.97	56 (25.23)	148 (66.67)	18 (8.11)
Practice	1-8	5.12±2.09	58 (26.13)	128 (57.66)	36 (16.22)
KAP	4-22	15.44±5.05	54 (24.32)	146 (65.77)	22 (9.91)

Table 3. Comparison of knowledge, attitude, and practice scores of COVID-19 among different demographic variables and primary composite outcomes.

Variables	*N*	Knowledge scores			Attitude scores			Practice scores		
		Mean±SD	*F*	*P*	Mean±SD	*F*	*P*	Mean±SD	*F*	*P*
Age, years										
<30	24	9.50±0.78	7.28	<0.001	2.83±0.56	3.95	0.009	5.50±2.02	2.31	0.070
30-50	70	8.46±2.36			2.60±0.93			5.54±2.13		
51-70	110	7.18±2.79			2.22±1.04			4.76±1.99		
>70	18	7.66±3.21			2.44±0.85			5.11±2.39		
Gender										
Male	172	7.90±2.70	0.06	0.800	2.40±0.95	0.21	0.640	5.01±2.14	1.94	0.160
Female	50	7.80±2.55			2.48±1.03			5.48±1.89		
Religion										
Hindu	214	8.50±2.67	0.44	0.500	2.75±0.97	0.93	0.330	5.12±2.12	0.02	0.870
Muslim	8	7.85±2.32			2.41±0.88			5.00±1.30		
Residential area										
Urban	210	8.00±2.59	9.08	0.003	2.45±0.96	4.72	0.030	5.17±2.09	2.62	0.100
Rural	12	5.66±2.99			1.83±0.93			4.16±1.94		
Level of education										
Illiterate	14	2.71±0.72	289.47	<0.001	0.85±0.36	64.12	<0.001	1.71±0.46	61.58	<0.001
Primary	50	4.64±1.56			1.56±0.86			3.32±1.42		
High school	34	8.94±1.27			2.88±0.68			5.76±1.85		
Graduate	124	9.48±1.04			2.82±0.68			6.04±1.58		
Occupation										
Healthcare related	38	8.63±1.74	3.65	0.050	2.73±0.86	4.81	0.020	6.05±1.95	9.48	0.002
Non-healthcare related	184	7.72±2.79			2.35±0.98			4.92±2.07		
Socio–economic class*										
Ⅰ	170	8.91±1.72	77.90	<0.001	2.74±0.83	39.25	<0.001	5.70±1.81	28.41	<0.001
Ⅱ	20	4.90±2.02			1.50±0.68			3.50±1.39		
Ⅲ	18	5.10±3.00			1.33±0.68			3.66±2.37		
Ⅳ	14	3.14±1.29			1.28±0.46			2.14±0.66		
Presence of primary composite outcome										
Yes	28	10.64±0.48	40.46	<0.001	2.21±0.78	1.47	0.030	3.28±1.11	27.38	<0.001
No	194	7.48±2.61			2.45±0.99			5.38±2.07		

*: No person in class Ⅴ.

Table 4. Multivariate regression analysis of the association between demographic variables and primary composite outcomes with knowledge, attitude, and practice scores of COVID-19.

Variables	Knowledge (adjusted R^2=0.81)				Attitude (adjusted R^2=0.47)				Practice (adjusted R^2=0.65)			
	B#	Beta	SE	*P*	B#	Beta	SE	*P*	B#	Beta	SE	*P*
Age												
⩾30	−0.19	−0.05	0.01	0.060	−0.05	−0.040	0.06	0.41	−0.01	−0.003	0.11	0.930
<30 (reference)	-	-	-	-	-	-	-	-	-	-	-	-
Residential area												
Urban	0.43	0.03	0.37	0.240	0.25	0.050	0.22	0.26	0.16	0.020	0.39	0.680
Rural (reference)	-	-	-	-	-	-	-	-	-	-	-	-
Education												
Primary and above	1.83	0.68	0.10	<0.001	0.49	0.500	0.06	<0.001	1.31	0.620	0.11	<0.001
Illiterate (reference)	-	-	-	-	-	-	-	-	-	-	-	-
Occupation												
Health care related	0.51	0.07	0.22	0.030	0.18	0.070	0.13	0.17	0.26	0.050	0.23	0.250
Non-health care related (reference)	-	-	-	-	-	-	-	-	-	-	-	-
Socio−economic class												
Class Ⅰ-Ⅲ	0.59	0.19	0.11	<0.001	0.29	0.270	0.06	<0.001	0.48	0.200	0.12	<0.001
Class Ⅳ (reference)	-	-	-	-	-	-	-	-	-	-	-	-
Presence of composite outcomes												
Yes	1.51	0.19	0.23	<0.001	−0.68	−0.230	0.14	<0.001	−2.99	−0.490	0.25	<0.001
No (reference)	-	-	-	-	-	-	-	-	-	-	-	-

#: Unstandardized coefficient.

Both of the mean knowledge and attitude scores for the age group of <30 years were higher than that of the other older age groups. Four age groups showed a statistically significant difference regarding the knowledge and attitude scores (P<0.001 and P=0.009, respectively). Otherwise, no significant difference in practice scores was observed among different age groups (P=0.07). No significant difference in KAP scores was found regarding gender. Patients belonging to the Hindu religion had higher mean KAP scores as compared to patients belonging to the Muslim religion, but the difference was not significant (P>0.05). Furthermore, patients living in urban areas had significantly higher knowledge and attitude scores in comparison to patients living in rural areas (P=0.003 and 0.03, respectively). Although the urban patients had higher practice scores than rural patients, the difference was not significantly different (P=0.10). Concerning the level of education, patients with higher education levels had higher knowledge and practice scores in comparison to those with lower education levels (both P<0.001). Similarly, patients with higher socioeconomic class had higher attitude scores in comparison to patients with lower socioeconomic class (P<0.001). Concerning occupation, patients with occupations related to healthcare had higher attitude and practice scores in comparison to patients with other occupations (P=0.02 and P=0.002). Furthermore, patients who met the primary composite outcomes had higher knowledge scores (P<0.001), lower attitude scores (P=0.03), and lower practice scores (P<0.001) in comparison to patients who did not.

Multiple linear regression analysis revealed that higher level of education, healthcare-related occupation, higher socioeconomic class, and the presence of primary composite outcomes were significantly associated with higher knowledge scores (P<0.05). The results also revealed that higher level of education and higher socioeconomic class were significantly associated with higher attitude score (P<0.001), and the presence of primary composite outcomes was significantly associated with lower attitude score (P<0.001). Furthermore, on multiple linear regression analysis concerning practice as a dependent variable, we found that higher level of education and higher socioeconomic class were significantly associated with higher practice score (P<0.001), and the presence of primary composite outcomes was significantly associated with lower practice score (P<0.001) (Table 4). There was a statistically significant positive correlation between knowledge and attitude (r=0.66, P<0.001) knowledge and practice (r=0.59, P<0.001), and attitude and practice (r=0.71, P<0.001) on Pearson's correlation coefficient.

4. Discussion

KAP regarding COVID-19 has been considered important for effective control and prevention of the pandemic[16]. In this study, KAP scores of COVID-19 patients towards COVID-19 were assessed. We found that most of the patients (63.06%) had average knowledge regarding COVID-19. The mean knowledge score was 7.88, with a 71.63% correct rate for knowledge. The mean KAP score and the overall correct rate were lower than in previous studies[12,15,17-18]. However, a study by Srichan *et al.* showed higher KAP scores towards COVID-19[19]. The knowledge and attitude scores for the younger (<30 years) were significantly higher than other older age groups. This may be attributable to more access to social media in the younger age group. Although no significant difference in practice score was observed among different age groups. Azlan *et al.* reported that patients above the age of 50 held higher knowledge scores[15]. No significant difference in KAP scores was found concerning gender. Studies by

Peng *et al.* and Erfani *et al.* found that the females had significantly higher KAP scores regarding COVID-19[16,17]. Ferdous *et al.* reported higher knowledge scores among younger and respondents from rural areas[20]. KAP scores regarding COVID-19 were significantly higher among patients with higher education levels and higher socioeconomic class. This may indicate ample accesses to prompt and reliable information about the COVID-19. Furthermore, attitude and practice scores were significantly higher among patients with an occupation related to healthcare. Their commitment and liability to combat the pandemic are thought to direct them to present more affirmative attitudes and perceptive practices[21]. These findings are in line with previous studies[13,15,17]. Multiple linear regression analysis revealed that having higher education level, having a healthcare-related occupation, having a higher socioeconomic class, and the presence of primary composite outcomes was significantly associated with higher knowledge scores. Srichan *et al.* found that marital status, occupation, education, and socioeconomic status were significant factors associated with higher knowledge scores regarding COVID-19, whereas Zhong *et al.* found that male gender, young age, marital status, being a student, and higher education were significantly associated with higher knowledge scores[12,19].

Furthermore, most of the patients (66.66%) had an average attitude regarding COVID-19. The mean attitude scores were 2.42, with an overall 60.50% correct rate for attitude. Attitude scores were significantly higher among young, urban, patients with higher education levels, with higher socioeconomic status, and with healthcare-related occupations. Based on multiple linear regression analysis higher education level and higher socioeconomic class were significantly associated with higher attitude scores. Erfani *et al.* reported an overall correct rate of attitude of 90% about COVID-19 and was significantly higher among the elderly, female, married, and having higher education[17]. In our study most of the patients accepted that media coverage gives much exposure to the COVID-19 related news, Janta Curfew, and lockdown of major cities will help to control the COVID-19, and the COVID-19 virus will be ultimately controlled, which are similar to a study by Maheshwari *et al.*[14]. Ferdous *et al.* reported that elderly, higher education level, having a joint family, being employed and higher socioeconomic class were sociodemographic factors associated with more positive attitudes regarding COVID-19[20]. Giao *et al.* reported that attitudes regarding COVID-19 were significantly associated with occupation but not with age and gender[13]. While, Saqlain *et al.* reported that attitude was not associated with age, gender, and occupation[22].

Based on the overall practice correct rate (64%), more than half of the patients adopted the practice to prevent infection by COVID-19. This could be due to the extensive media coverage regarding the high transmission and infectivity of the COVID-19 virus. Though, these scores were lower than those reported by Zhong *et al.* and Erfani *et al.*[12,17]. Unfortunately, the present study found that 41.4% did not maintain social distancing, 34.2% did not use hand sanitizer and mask, 33.3% did not use handkerchief coughing and sneezing, and 24.3% did not avoid unnecessary travel during the outbreak. These hazardous practices were found to be associated with lower education level, occupation not related to healthcare, low socioeconomic status, poor COVID-19 knowledge, and presence of primary composite outcome. These findings are similar to previous studies[12,17]. Contrary to this, Azlan *et al.* reported lower practice scores toward COVID-19 among people with high socioeconomic status[15]. Saefi *et al.* reported poor practice with female gender, younger age, and rural residential area[23]. Based on multiple linear regression analysis, higher education level and higher socioeconomic class were significantly associated with higher practice scores. Ferdous *et al.* reported that the socio-demographic factors associated with the better practice were female gender, elderly, higher education, higher socioeconomic status, urban habitat, and having more proactive attitudes[20]. While, Zhong *et al.* reported that male gender, occupation of students, and higher COVID-19 knowledge scores were significantly associated with better practice[12]. Furthermore, our study showed that higher knowledge about COVID-19 was significantly associated with a positive attitude and good practice regarding the COVID-19, similar to previous studies[12,17]. Interestingly, in this study patients with poor outcomes had more knowledge scores, but less attitude and practice scores. This may be attributable to stress in patients with more knowledge about COVID-19, as stress may worsen the outcome.

This study has several limitations. The first is this study is a cross-sectional design of the study, consequently, a causal relationship may not be established. Second, this study is being conducted in COVID-19 patients admitted to a hospital, and consequently the results unlikely to reflect the whole population. Third, the questions related to knowledge, attitude, and practice were limited.

To conclude, overall KAP regarding COVID-19, in patients with COVID-19 was average and lower among patients with low education level, with low socioeconomic status and occupation not related to healthcare. Besides patients who had poor outcomes (admission to intensive care unit, the requirement of mechanical ventilation, or in-hospital death), had better knowledge, but less favorable attitudes and unsafe practices regarding COVID-19. Our findings suggest the necessity of practical and targeted health education programs focused to improve COVID-19 related awareness.

Conflict of interest statement

The authors report no conflict of interest.

Authors' contributions

H.R.N. contributed to the project design, data interpretation, drafting the article, revising it critically, and final approval of the version to be published; P.S. and A.R.C. contributed by project

design, data interpretation, statistical analysis, article preparing, and submission; S.A., K.K., A.A. contributed by the collection of data, statistical analysis, and data interpretation. All authors contributed equally to the final version of the manuscript. The manuscript has been read and approved by all the authors that the requirements for authorship have been met, and each author believes that the manuscript represents honest work.

References

[1] Euro surveillance Editorial Team. Note from the editors: World Health Organization declares novel coronavirus (2019-nCoV) sixth public health emergency of international concern. *Euro Surveill* 2020; **25**(5): 200131e.

[2] World Health Organization. WHO announces COVID-19 outbreak a pandemic. [Online] Available from: http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid19/news /2020/3/who-announces-covid-19-outbreak-a-pandemic [Accessed on 17th January 2021].

[3] Andrews MA, Areekal B, Rajesh KR, Krishnan J, Suryakala R, Krishnan B, et al. *Indian J Med Res* 2020; **151**(5): 490-492.

[4] Ministry of Health and Family Welfare, government of India. COVID-19 INDIA as on: 17 January 2021. [Online] Available from: https://www.mohfw.gov.in/. [Accessed on 17th January 2021].

[5] 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**(10223): 507-513.

[6] Ajilore K, Atakiti I, Onyenankeya K. College students' knowledge, attitudes and adherence to public service announcements on Ebola in Nigeria: Suggestions for improving future Ebola prevention education programmes. *Health Educ J* 2017; **76**(6): 648-660.

[7] Tachfouti N, Slama K, Berraho M, Nejjari C. The impact of knowledge and attitudes on adherence to tuberculosis treatment: a case-control study in a Moroccan region. *Pan Afr Med J* 2012; **12**: 52.

[8] Bell DM. Public health interventions and SARS spread, 2003. *Emerg Infect Dis* 2004; **10**(11): 1900-1906.

[9] Person B, Sy F, Holton K, Govert B, Liang A, National Center for Inectious Diseases SCOT. Fear and stigma: the epidemic within the SARS outbreak. *Emerg Infect Dis* 2004; **10**(2): 358-363.

[10]Tao N. An analysis on reasons of SARS-induced psychological panic among students. *J Anhui Institute Educ* 2003; **21**: 78-79.

[11]Pandey VK, Aggarwal P, Kakkar R. Modified BG Prasad's Socio-economic Classification-2018: The need of an update in the present scenario. *Indian J Comm Health* 2018; **30**(1): 82-84.

[12]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.

[13]Giao H, Nguyen TNH, Tran VK, Vo KN, Vo VT, Pham LA. Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. *Asian Pac J Trop Med* 2020; **13**(6): 260-265.

[14]Maheshwari S, Gupta PK, Sinha R, Rawat P. Knowledge, attitude, and practice towards coronavirus disease 2019 (COVID-19) among medical students : A cross-sectional study. *J Acute Dis* 2020; **9**(3): 100-104.

[15]Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. *PLoS One* 2020; **15**(5): ee0233668.

[16]Peng Y, Pei C, Zheng Y, Wang J, Zhang K, Zheng Z, et al. A cross-sectional survey of knowledge, attitude and practice associated with COVID-19 among undergraduate students in China. *BMC Public Health* 2020; **20**(1): 1292.

[17]Erfani A, Shahriarirad R, Ranjbar K, Mirahmadizadeh A, Moghadami M. Knowledge, attitude and practice toward the novel coronavirus (COVID-19) outbreak: A population-based survey in Iran. *Bull World Health Organ* 2020. doi: http://dx.doi.org/10.2471/BLT.20.256651.

[18]Rugarabamu S, Ibrahim M, Byanaku A. Knowledge, attitudes, and practices (KAP) towards COVID-19: A quick online cross-sectional survey among Tanzanian residents. *medRxiv* 2020; **216**: 1-18.

[19]Srichan P, Apidechkul T, Tamornpark R, Yeemard F, Khunthason S, Kitchanapaiboon S, et al. Knowledge, attitude and preparedness to respond to the 2019 novel coronavirus (COVID-19) among the bordered population of northern thailand in the early period of the outbreak: A cross-sectional study. [Online] Available from: https://dx.doi.org/10.2139/ssrn.3546046. [Accessed on 17th January 2021].

[20]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.

[21]Heung YY, Wong KY, Kwong WY, To SS, Wong HC. Daniel Wong. Severe acute respiratory syndrome outbreak promotes a strong sense of professional identity among nursing students. *Nurse Educ Today* 2005; **25**(2): 112-118.

[22]Saqlain M, Munir MM, Ur Rehman S, Gulzar A, Naz S, Ahmed Z, et al. Knowledge, attitude, practice and perceived barriers among healthcare professionals regarding COVID-19: A cross-sectional survey from Pakistan. *J Hosp Infect* 2020; **105**(3): 419-423.

[23]Saefi M, Fauzi A, Kristiana E, Cahya W, Muchson M, Setiawan ME, et al. Survey data of COVID-19-related knowledge, attitude, and practices among indonesian undergraduate students. *Data Brief* 2020; **31**: 105855.