# **Original Research Article**

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# Knowledge, attitude, and practice towards COVID-19 prevention: a survey of Sudanese people

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# **ABSTRACT**

**Background:** The awareness and belief of people on coronavirus disease 2019 (COVID-19) prevention often influence their practices toward the disease. Therefore, it is essential to assess people's knowledge, attitude, and practice towards COVID-19 prevention; to inform policymakers.

**Methods:** An online survey was conducted on 1455 Sudanese adults using a pretested questionnaire. Chi-square test, spearman's correlation, and logistic regression were used to analyse the data using statistical package for social sciences (SPSS) version-25.

**Results:** The study found relatively good knowledge, attitude, and practice on COVID-19 prevention with overall correct rates of 84.6%, 88.8 %, and 78.6%, respectively. Furthermore, knowledge was positively correlated with attitude (r=0.355, P<0.001). Participants with good knowledge were more likely to have a positive attitude and practice (OR=1.36; 95%CI:1.08-1.71; OR=1.52; 95%CI:1.36-1.71), respectively than those with insufficient knowledge. While participants with a positive attitude were more than two times (OR=2.36; 95%CI:1.86-2.99) more likely to have good practice than a negative attitude. Moreover, females and married were more likely to have good practice (OR=1.37; 95%CI:1.10-1.69; OR=1.26; 95%CI:1.02-1.55), and positive attitudes (OR=1.39; 95%CI: 1.10-1.77; OR=1.45; 95% CI:1.15-1.84), respectively than their corresponding targeted counterparts. Furthermore, certain occupations (housewife, no worker, and employed) were more likely to have positive attitude and practice than the student (p<0.05). Besides, considerable participants had misconceptions regarding; effectiveness of antibiotics in combating COVID-19 (32%); almost two-thirds of participants either never wearing masks or sometimes.

**Conclusions:** The finding concluded that relatively good knowledge, positive attitude, and desired practices against prevention of COVID-19. Therefore, a great emphasis on health awareness campaigns should focus on risk-taking practice and remove misconceptions.

**Keywords:** Knowledge, Attitude, Practice, COVID-19, Sudanese people

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# INTRODUCTION

Coronavirus disease of 2019 (COVID-19) is an emerging infectious disease that first occurred in Wuhan, then spread rapidly worldwide.<sup>1-3</sup> It has been declared by the World Health Organization (WHO) as a "Pandemic" with no boundaries.<sup>1-3</sup> As per the WHO 14<sup>th</sup> August 2021, there are >207 million confirmed cases and >4 million deaths from 216 countries and territories.<sup>4</sup> The WHO's emergency declaration was driven by the virus's worries expanding to countries with weak health systems, mainly in Africa, which has extensive ties to China.<sup>4,5</sup>

On 14<sup>th</sup> February 2020, Africa reported the first confirmed case in Egypt.<sup>6</sup> But as per 14<sup>th</sup> August 2021, there were >5 million COVID-19 confirmed cases and 125,461 deaths reported in 47 African countries.<sup>7</sup> However, it is believed that the confirmed number of cases could be an underestimation due to widespread under-reporting in many African countries with weak healthcare systems.<sup>8,9</sup> Sudan's first case was reported on 13<sup>th</sup> March 2020.<sup>10</sup> By 14th August 2021, Sudan had a total of 37,543 confirmed cases with 2804 deaths.<sup>11,12</sup>

With the emerging burden of COVID-19 to Sudanese people, Sudan's government adopted a raft of measures to slow down the spread of COVID-19. The measures included; curfew in a specific time, public transportation suspension, temporary closure of educational institutions, closure of markets, malls, and public places, working from home, the prohibition of social gathering, and initiated a massive campaign to increase the awareness on COVID-19 prevention. 10,12

Furthermore, Khartoum state was locked down and some parts of the country residents were required to stay at home minimize contact with others. <sup>10</sup> To facilitate the prevention and control of COVID-19 in Sudan, there is an urgent need to understand the public's knowledge, attitude, and practice (KAP) towards COVID-19 prevention. Therefore, the study aimed to assess the KAP towards preventing COVID-19 among Sudanese people during the rise period of the COVID-19 epidemic.

# **METHODS**

### Study design

An online survey was conducted between April 26 to May 5, 2020, during the lockdown period in Sudan. This was the preferred method due introduced lockdown in the country, limiting face-to-face meetings.

## Study area and study population

Sudan is the third-largest country in African and Arab countries, located in Northeast Africa with a population of 42.8 million in 2019. ¹³ It has an area of 1,861,484 km2 and composed of 18 states. ¹³ The study involved participant age ≥18 years living in Sudan.

#### Sample size

The minimum sample size was (1421) when calculated by the following formula:

$$Z^2p(1-p) \div d^2$$

whereas the assumption of the proportion of good knowledge, attitude, and practice toward COVID-19 is 50% with 95% confidence interval and 0.026 precision. <sup>14</sup> A total of 1455 completed questionnaires were received and included in the study using a convenient sampling method.

#### Data collection

The survey was designed in the webpage using Google Form. The link was distributed via social media (Facebook and WhatsApp) for broader circulations to eligible participants all over the Sudan. The questionnaire contained two sections: first demographic characteristics (gender, age, occupation, marital status, educational level, and residence); second assessment of the KAP against prevention of COVID-19. While Knowledge was defined as awareness of the population against the prevention of COVID-19.15 The knowledge had 13 questions; each question was answered 'yes', 'no' or 'I don't know'. The correct answer scored 1 and incorrect answer or I do not know scored 0. Attitude was defined as the way the population thinks and behaves against prevention of COVID-19.15 It was measured by nine questions with a three-point Likert's scale agree (1 point); no idea and disagree (0 point) for active questions. Practice was defined as the habitat of the population involvement to prevent COVID-19.15 The practice section had seven items, and each item was answered 'always' (2 point), 'sometimes' (1 point) or 'never' (0 point).

To ensure the quality of data collection, experts in the public health and epidemiology field reviewed the questionnaire and pretested to measure reliability (0.732) by using Cronbach's alpha test.

# Data management and analysis

The data were downloaded in MS excel version 2010 and then exported to Statistical package for social sciences (SPSS) version 25. Frequencies, percentage, and chisquare tests were used to compare demographic variables and KAP. Shapiro-wilk test was made to check the normality of continuous variables. While, median was used to classify KAP score. The total scores of knowledge was computed; ranging between (0-13) and the median (11; IQR:10-12) score was used to classify the knowledge. Participants with ≥11 (correct answer rate x100%=84.6%) were considered as having good knowledge. Furthermore, the median score of attitudes was 8 (IQR:7-8) ranging from (0-9) scores. Participants with  $\geq$ 8 (with correct answer rate 8/9 x100%= 88.8%) were considered having a positive attitude. While the median score of practice was 11(IQR:9-13) ranging from (0-14) scores. Participant's  $\geq 11$  (with the correct answer rate  $11/14 \times 100\% = 78.6\%$ ) were considered having good practice. Spearman correlation was performed to identify the correlation between KAP. A binary logistic regression test was used to identify significant associated demographic variables with attitude and practice. All results were presented by coefficients (B) and odds ratio (OR) with confidence interval (CI), as well as 2-sided, and p<0.05 was considered significant.

#### Ethical consideration

Ethical approval was sought from the Research Ethics Committee at the Ministry of Health, Northern state of Sudan. The informed consent was sought from the participants. Those who agree to participate in our study were instructed to clicking the link and complete the questionnaire.

#### **RESULTS**

A total of 1455 participants completed the online survey. About 52.8% were males, the mean age was 33.84±11.44 years ranging from 18-80 years. More than half (54.7%) were employed, and most of them (62.7%) had bachelor's

degree, while almost half (49.3%) of the participants were married, as shown in Table 1.

This study found that 70% of the respondents had good knowledge (total score ≥median score). The proportion of good knowledge on COVID-19 prevention was significantly high among middle age (20-59 years), certain occupations (employed, student, and no worker), and with higher education levels (p value <0.001). While, the proportion of participants with a positive attitude and good practice on COVID-19 prevention were 73.6% and 60.7% respectively; these proportions were significantly increasing with an increase in age, females, certain occupations (housewife, employed, and no worker), and married participants (p<0.05) as shown in Table 1.

Table 2 reveals that the proportion of correct answer on the knowledge of COVID-19 prevention ranged from 68-99%. While the proportion of different answers to positive attitude with a three-point Likert's scale ranged from 98.1-50.6% as shown in Table 3. Moreover, the proportion of seven practice questions on COVID-19 prevention always ranged between 81.1-38.5%, sometimes range between 40.1-12, and never ranges between 1.2-43.2% as shown in Table 4.

Table 1: Demographical characteristics and knowledge, attitude, and practice of participants.

	Total	Knowledge	:	Attitude		Practice	
Variables	N (%)	Good N (%)	Bad N (%)	Positive N (%)	Negative N (%)	Good N (%)	Bad N (%)
Overall	1455 (100)	1017 (70)	438 (30)	1071 (73.6)	384 (26.4)	883 (60.7)	572 (39.3)
Age group (in	ı years)						
<20	128 (8.8)	74 (57.8)	54 (42.2)***	72 (56.3)	56 (43.8)***	63 (49.2)	65 (50.8)**
20-39	903 (62.1)	651 (72.1)	252 (27.9)	667 (73.9)	236 (26.1)	534 (59.1)	369 (40.9)
40-59	383 (26.3)	271 (70.8)	112 (29.2)	299 (78.1)	84 (21.9)	258 (67.4)	125 (32.6)
>60	41 (2.8)	21 (51.2)	20 (48.8)	33 (80.5)	8 (19.5)	28 (68.3)	13 (31.7)
Gender							
Male	768 (52.8)	538 (70.1)	230 (29.9) <sup>ns</sup>	542 (70.6)	226 (29.4)**	439 (57.2)	329(42.8)**
Female	687 (47.2)	479 (69.7)	208 (30.3)	529 (77)	158 (23)	444 (64.6)	243(35.4)
Occupation							
Student	328 (22.5)	225 (68.6)	103 (31.4)***	216 (65.9)	112 (34.1)**	166 (50.6)	162(49.4)***
Employee	796 (54.7)	601 (75.5)	195 (24.5)	604 (75.9)	192 (24.1)	495 (62.2)	301(37.8)
Free worker	133 (9.1)	72 (54.1)	61 (45.9)	92 (69.2)	41 (30.8)	78 (58.6)	55(41.4)
Housewife	90 (6.2)	52 (57.8)	38 (42.2)	75 (83.3)	15 (16.7)	68 (75.6)	22(24.4)
No worker	69 (4.7)	48 (69.6)	21 (30.4)	57 (82.6)	12 (17.4)	53 (76.8)	16(23.2)
Others	39 (2.7)	19 (48.7)	20 (51.3)	27 (69.2)	12 (30.8)	23 (59.0)	16(41.0)
Education							
Less than university	130 (8.9)	50 (38.5)	80 (61.5)***	94 (72.3)	36 (27.7) ns	85 (65.4)	45(34.6) ns
University	912 (62.7)	645 (70.7)	267 (29.3)	668 (73.2)	244 (26.8)	536 (58.8)	376(41.2)
Above university	413 (28.4)	322 (78)	91 (22)	309 (74.8)	104 (25.2)	262 (63.4)	151(36.6)
Marital statu	S						
Married	717 (49.3)	495 (69)	222 (31) ns	554 (77.3)	163 (22.7)**	455 (63.5)	262 (36.5)*
Single	738 (50.7)	522 (70.7)	216 (29.3)	517 (70.1)	221 (29.9)	428 (58.0)	310 (42.0)

Symbols reveals to the degree of statistical significance: ns >0.05; \*<0.05; \*\*<0.01 \*\*\* <0.001.

Table 2: Proportion of those who have correct knowledge among study population in Sudan.

Knowledge	Yes N (%)	No N (%)	I don't know N (%)
Is COVID-19 is contagious?	1441 (99)¥	9 (0.6)	5 (03)
Is COVID-19 transmitted through droplets of infected person when coughing or sneezing?	1431 (98.4) <sup>¥</sup>	9 (0.6)	15 (1.0)
Is fever, fatigue, and dry cough are the most common symptoms of COVID-19?	1427 (98.1)¥	9 (0.6)	19 (1.3)
Is some people affected by COVID-19 without appear of any sign and symptoms and cure without treatment?	1081 (74.3)¥	158 (10.9)	216 (14.8)
Is COVID-19 transmitted by touching contaminated surface and then touching nose, mouth or eyes?	1422 (97.7)¥	13 (0.9)	20 (1.4)Continued.
Is COVID-19 doesn't affect children?	115 (7.9)	1205 (82.8)¥	135 (9.3)
Not all affected with virus develop serious symptoms only elderly and those with chronic diseases	1214 (83.4)¥	172 (11.8)	69 (4.7)
Is people who contact the infected person or returning from affected countries must be quarantine for 14 days	1436 (98.7) <sup>¥</sup>	5 (0.3)	14 (1.0)
Is affected person with minor symptoms cannot transmit the infection	74 (5.1)	1196 (82.2) <sup>¥</sup>	185 (12.7)
Is antibiotics are effective in prevention and treatment of COVID-19?	191 (13.1)	990 (68) <sup>¥</sup>	274 (18.8)
Is COVID-19 doesn't have treatment and vaccine	1317 (90.5)	52 (3.6)	86 (5.9)
Is washing hand with soap and using sterilizers frequently one of the most effective methods to prevent infection	1439 (98.9)¥	10 (0.7)	6 (0.4)
Is wear face mask when leaving house frequently one of the most effective methods to prevent infection	1232 (84.7) <sup>¥</sup>	17 (12.9)	36 (2.5)

<sup>¥</sup> indicate correct answer

Table 3: Proportion of different attitude toward COVID-19 among study population in Sudan.

Attitude	Agree N (%)	No idea N (%)	Disagree N (%)
Do you think lock of the schools and universities are necessary to control the epidemic	1428 (98.1)¥	10 (0.7)	17 (1.2)
Do you think the curfew decision is necessary to control the epidemic?	1405 (96.6)¥	10 (0.7)	40 (2.7)
Do you think the stop work decision is necessary to control the epidemic?	1368 (95.3)¥	18 (1.2)	51 (3.5)
Do you think the decision to lock the market and forbidden gathering people are necessary to control the epidemic?	1397 (96)¥	15 (1.0)	43 (3.0)
Do you think the decision about forbidden to performed group prayer in the Mosque is necessary to control the epidemic?	1243 (85.4)¥	212 (14.6)	0
Do you think the decision about forbidden gathering people in breakfast during fasting month is necessary to control the epidemic?	1355 (93.1)¥	29 (2.0)	71 (4.9)
Do you think that wearing mask when going outside is necessary to control the epidemic?	1232 (84.7)¥	52 (3.6)	171 (11.8)
Do you think that social distance measure is necessary to control the epidemic?	1425 (97.9)¥	14 (1.0)	16 (1.1)
Do you think that COVID-19 can be treated by herbal medicine?	258 (17.7)	461 (31.7)	$736 (50.6)^{4}$

<sup>¥</sup> indicate correct answer.

Table 4: Practices toward COVID-19 among study population in Sudan.

Practices	Always N (%)	Some times N (%)	Never N (%)
I frequently wash my hand by soap more than 20 second especially when touch contaminated surfaces or object	826 (56.8)	583(40.0)	46(3.2)
I cover my mouth and nose with a tissue or by elbow when coughing or sneezing	1170(80.4)	262(18.0)	23(1.6)
Staying at home unless absolutely necessary	1037(71.3)	368(25.3)	50(3.4)
I avoid going to crowded places	1180(81.1)	257(17.7)	18(1.2)
I avoid shaking hand and make almost two meters between me and others	652(44.8)	174(12.0)	629(43.2)
Take care of warning mask especially when leaving home	560(38.5)	551(37.9)	344(23.6)
I adhered to social distance as much as possible until combat the epidemic	949(65.2)	454(31.2)	52(3.6) Continued.

Table 5: Binary logistic regression to predict participant with good attitude and practice among study population.

X7 • 11	Attitude	Practice
Variables	OR (95%CI)	OR (95%CI)
Knowledge		
Bad	Reference	Reference
Good	1.52 (1.36-1.71)***	(1. 08-1.71)**1.36
Attitude		
Negative	Reference	Reference
Positive	-	2.36 (1.86-2.99)***
Age group		
<20 years	Reference	Reference
years 20-39	2.19 (1.51-3.21)***	1.49 (1.03-2.16)*
40-59 years	2.77 (1.81-4.23)***	2.13 (1.41-3.56)***
>60 years	3.21 (1.37-7.49)**	2.22 (1.06-4.65)*
Gender		
Male	Reference	Reference
Female	1.39 (1.10-1.77)**	1.37 (1.10-1.69)**
Occupation		
Student	Reference	Reference
Employee	1.63 (1.23-2.16)**	1.61 (1.23-2.12)**
Free worker	1.16 (0.75-1.79) ns	1.38 (0.92-2.08) <sup>ns</sup>
Housewife	2.59 (1.42-4.72)**	3.01 (1.78-5.11)***
No worker	2.46 (1.27-4.78)**	3.23 (1.77-5.88)***
Others	1.16 (0.57-2.39) ns	1.40 (0.71-2.75) <sup>ns</sup>
Education		
Less than scondary	Reference	Reference
University	1.05 (0.69-1.58) <sup>ns</sup>	0.75 (0.51-1.11) <sup>ns</sup>
Above university	1.14 (0.73-1.77) <sup>ns</sup>	0.92 (0.61-1.39) <sup>ns</sup>
Marital status		
Single	Reference	Reference
Married	1.45 (1.15-1.84)**	1.26 (1.02-1.55)*

Symbols reveals to the degree of statistical significance: ns >0.05; \*<0.05; \*\*<0.01 \*\*\* <0.001; OR: Odd ratio; CI: Confidence interval

Binary logistic regression was done to test the effect of independent variables (Knowledge, attitude, age group, sex, occupation, education level, and marital status) on the likelihood that the participants have good practice (dependent variable). The finding indicates that the associations were statistically significant;  $\chi 2(7)=121.075$ , p<0.0001. Participants with good knowledge were more

than one and a third (OR=1.36; 95% CI:1.08-1.71) times more likely to have good practice compared to those with bad knowledge. While, Participants with positive attitude were more than two times (OR=2.36; 95% CI:1.86-2.99) more likely to have good practice compared to participants with negative attitude. Moreover, spearman's correlation analysis confirms a positive correlation between

knowledge and attitude (r=0.355, p<0.001) as well as attitude and practice (r=0.308, p<0.001).

Besides, an increase in age was significantly associated with good practice; while age group 20-39 years almost one and half times (OR=1.49; 95% CI:1.03-2.16), 40-59 years more than two (OR=2.13; 95% CI:1.41-3.56) times, and >60 years more than two (OR=2.22; 95% CI:1.06-4.65) times more likely to have good practice compared to younger age group. Females were one and a third (OR=1.37; 95% CI:1.10-1.69) times more likely to have good practice than males.

Furthermore, certain occupations have significantly increased the practice, such as; housewife (OR=3.01; 95% CI:1.78-5.11), no worker (OR=3.23; 95% CI:1.77-5.88), and employed (OR=1.61; 95% CI:1.23-2.12) times more likely to have good practice compared to the student. Simultaneously married were more than one and a quarter (OR=1.26; 95% CI:1.02-1.55) times more likely to have good practice than not married, as shown in Table 5.

When attitude was chosen as a dependent variable to find the effect of independent variables (Knowledge, age group, sex, occupation, education level, and marital status) on the likelihood that the participants have a positive attitude, the finding indicates that the predictors were statistically significant;  $\gamma 2(6)=174.979$ , p<0.001. The model indicates that the participant with good knowledge was almost one and a half times (OR=1.52; 95% CI:1.36-1.71) more likely to have a positive attitude than bad knowledge. Moreover, females were almost one and third times (OR=1.39; 95% CI: 1.10-1.77) more likely to have a positive attitude than males. Also, increase in the age group had significantly likelihood that the participant had a positive attitude; age between 20-39 years, 40-59 years, and >60 years were (OR=2.19; 95% CI:1.51-3.21), (OR=2.77; 95% CI:1.81-4.23), and (OR=3.21; 95% CI:1.37-7.49) more likely to had positive attitude respectively compared to younger age group. Moreover, certain occupations had significantly increased on the attitude, such as; employed, housewife, and non-worker (OR=1.63; 95% CI:1.23-2.16), (OR=2.59; 95% CI:1.42-4.72), and (OR=2.46; 95% CI:1.27-2.39) were more likely to have good attitude compared to the student. Simultaneously married were almost one and a half (OR=1.45; 95% CI:1.15-1.84) times more likely to have positive attitude than non-married, as shown in Table 5.

## DISCUSSION

So far, COVID-19 is an emerging infectious with no approved treatment or vaccine. <sup>13,16</sup> Therefore, the most important measures to prevent and control it should focus on; social distance, personal protection, and hygiene as well as quarantine and isolation. <sup>16</sup> All these measures' success mainly depends on the population's awareness of the disease. <sup>17</sup>

This study confirms that knowledge and attitude were vital in the COVID-19 pandemic prevention. Since there was a significant correlation between knowledge gained and attitude generated, leading to the required practice towards the prevention of COVID-19.<sup>18-20</sup> This result was further confirmed by binary logistic regression; in which participates with good knowledge was more likely to have positive attitude. Besides, the participant with positive attitude was more likely to have good practice towards the prevention of COVID-19.

The finding of this study suggested relatively good knowledge regarding the prevention of COVID-19 as represented by an overall correct answer rate of knowledge questions was 84.6%, which was similar to an earlier study conducted in Sudan.<sup>2</sup> Our finding was slightly lower than the survey conducted among the Chinese population (90%).<sup>19</sup> This difference might be due to the extreme contagiousness and fast spread of the pandemic firstly, it starts in China, and Chinese population; they can easily access relevant information using high-speed internet connection compared to our population.<sup>21</sup>

In this study, we found that the knowledge was significantly increased with a higher education level. Moreover, it was significantly increased among middle-aged participants, and certain occupations (employed and student); Most of the respondents in these groups held a bachelor or postgraduate degree. Several studies confirmed the relationship between education level and acquiring knowledge about the prevention of highly infected diseases like COVID-19. 19,22,23

The study reveals a misconception among almost a third of respondents about antibiotics could effectively treat and protect against COVID-19. This finding agrees with the study done in Jordan among university students which found 20.6% of their participants believed antibiotics could protect against COVID-19.<sup>17</sup> According to the WHO, antibiotics are not helpful in treating COVID-19 but can only treat secondary bacterial infections.<sup>24</sup> A study conducted in several European countries confirmed that antibiotics might partially impact the increased case fatality rate by affecting the patient's immunity system during COVID-19 infection.<sup>24</sup>

Besides, our findings suggest that a high percentage of positive attitude and good practice with the overall correct answer rate were 88.8% and 78.6%, respectively. Simultaneously, the percentage of positive attitude and good practice was significantly increased in older, females, and certain occupations (housewife and employed). A similar result was found in several studies that indicate females, and older had a positive attitude and practice compared to males and younger, which is contracted with the study conducted in Tanzanian; they found no significant differences across genders towards an attitude of COVID-19. 19,23,25-28 This might be due to females, and older always have positive beliefs and practices toward their health.

Furthermore, housewife and employed had significantly better attitudes and practice against the prevention of COVID-19 compared to the students. These could be due to most of these occupations in our study had higher education levels and in middle age which positively increased the protective belief and behavior against the prevention of COVID-19. While most students are younger and commonly risk-taking behavior against their health.<sup>19</sup>

This study shows that almost one-fifth of participants believe that COVID-19 can be treated by herbal medicine. This result was similar to the study's findings in Saudi Arabia, around 14.9% of the participants reported that they had used herbal products or nutritional supplements during the pandemic period to protect themselves from the disease. Herbal products and food supplements are used worldwide to enhance health or help with the health-associated disorder. The absence of new pharmacological treatments to fighting COVID-19 and drug-resistant infections has turned attention to medicinal plants as a potential source of effective treatment of the disease.

In addition, 15.3% of participants do not believe about the importance of wearing masks, and almost two-thirds of participants never or sometimes wearing masks when going outside to the public place, which was similar to an earlier study conducted in the Sudan.<sup>2</sup> This finding disagrees with many studies in which most of their respondents wore masks when going to public places. <sup>19,23,30</sup> This finding might be due to controversy about the importance of wearing mask in public places. <sup>17,31</sup> In the beginning, the WHO stated that no evidence of the benefit of wearing a mask in public places. <sup>17,31</sup> After that, WHO advises all governments to encourage their population to wear masks where there is widespread of COVID-19 transmission. <sup>17,31</sup> In addition, the scarce of availability of mask and increased it price.

This study points out that more than one-third of participants partially or never adhere to the social distance. This is lower than the finding of the studies conducted in China, Bangladesh, and Egypt, which indicated most of the participants had maintained social distances, as people comply with the regulations and orders issued by the official sectors. <sup>17,19,23</sup> Furthermore, more than half of responders neither did not avoid shaking hand nor make distance about two meters from others (12% never and 43.2% sometimes). This disagree with the WHO's recommendation to prevent COVID- 19 through avoiding physical contact when greeting safely. <sup>32</sup> Generally, wearing a face mask, social distancing, and avoiding shaking hands are uncomfortable and feel unnatural for Sudanese culture and legacies.

The finding should be considered with the following limitations: First, its online survey is distributed via social media (Facebook and What Sapp); only those who have smartphones and internet access can participate in this study. Secondly, the cross-sectional study design cannot

accurately determine the causal relationship between variables.

#### **CONCLUSION**

In general, the study concluded that relatively good knowledge, positive attitude, and desired practices on COVID-19 prevention. Therefore, a great emphasis on health awareness campaigns should focus on those (students, males, and younger) engaged in the risk-taking practice and removed misconceptions regarding social distance, shaking hands, and wearing masks.

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Institutional Ethics Committee

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