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Research Article

Knowledge, Attitudes, and Practices Surrounding COVID-19 among Sudan Citizens during the Pandemic: An Online Cross-sectional Study

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Abstract

Background: A number of protective and cautionary protocols have been adopted to control the rapid spread of COVID-19 in Sudan. People's commitment to these protocols is affected by their knowledge, attitudes, and practices (KAP).

Objective: To measure the Sudanese population's KAP in relation to COVID-19 during the pandemic.

Method: A web sample was enrolled with success via the authors' relations with citizens and standard media in Khartoum, Sudan. A self-administered online KAP questionnaire was completed by the respondents.

Results: Among the study sample (n=2336),66.4% between 18 and 29 years old, 60.7% were ladies, 75.9% had a high school education, and 76.1% were Khartoum citizens. The general correct rate of the knowledge questionnaire was 84.7%. The majority of the participants (94.8%) were ready to commit to the decision of staying at home. A large proportion of the participants (92%) frequently washed their hands or using antiseptic.

Conclusion: Health teaching programs geared to enhancing COVID-19 knowledge are useful for Sudan citizens fostering positive attitudes and disseminating knowledge relating to helpful practices. Due to the limited sample representativeness, we must be cautious when generalizing these findings.

Keywords: Knowledge, Attitude, Practice, COVID-19, Sudan.

1. Introduction

Coronaviruses are a big family of viruses which can cause health problems in animals and humans. In humans, many coronaviruses are known to cause respiratory illnesses starting from the common cold to more severe diseases like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) [1].

A continuing pandemic of pneumonia related to a novel coronavirus, called severe respiratory syndrome coronavirus 2 (SARS-Co-2), was reported in Wuhan, Hubei

province China in December 2019. In the following weeks, infections spread across China and other countries around the world. The Chinese public health, clinical, and scientific communities took prompt action and shared the infective agent gene sequence to the world. On January 30, 2020, the World Health Organization (WHO) declared the natural event a public health emergency of global concern [2].

The ongoing COVID-19 pandemic has spread rapidly and by April 29, 2020, the virus had reached 213 countries, leading to 2,995,758 laboratory-confirmed cases and 204,987 confirmed deaths since December 2019. In reaction to the current circumstances, the WHO announced a public health emergency of global attention on January 30 and called for cooperative efforts of all countries to inhibit the speedy spread of COVID-19 [3, 4].

At the time of writing, the source of SARS-CoV-2, the coronavirus (CoV) leading to COVID-19, remains uncertain. All available proofs suggest that SARS-CoV-2 has a natural animal origin and is not a constructed virus. The SARS-CoV-2 virus most likely has its ecological reservoir in bats. SARS-CoV-2 belongs to a group of genetically connected viruses, which also include SARS-CoV and several different CoVs isolated from bats populations [1].

People may get COVID-19 from individuals who have the virus. The disease can transmit from person to person through small droplets from the nose or mouth which are spread once someone with COVID-19 coughs or exhales. These droplets land on objects and surfaces around the person. Other people then get COVID-19 by touching these objects or surfaces, then touching their eyes, nose or mouth. People can also get COVID-19 if they breathe in droplets from someone with COVID-19 who coughs out or exhales droplets. This is why it is necessary to stay more than one meter away from anyone who is ill [1].

While SARS-CoV-2 RNA has been detected in stool and blood, neither fecal-oral nor bloodborne transmission seems to be important sources of infection. The SARS-CoV-2 infection has been described in animals, however, there is no proof to recommend that animals are a significant source of transmission [5].

There is an instant necessity to know the public's awareness of COVID-19 at this alarming period to promote outbreak management of COVID-19 in Sudan. In this study, we were measuring the KAP towards COVID-19 of Sudan citizens throughout the speedy rise interval of the COVID-19 outbreak.

2. Methods

2.1. Participants

We conducted this cross-sectional study from March 25 to April 4, 2020.

Throughout this period it was not possible to achieve a community-based sampling study so, we decided to gather the data online leveraging the authors' relations with people who live in Sudan posting the survey link on WhatsApp, Telegram groups, Facebook, and Twitter applications.

This online post included a short introduction about our study's aims, the free choice for participation, and statement of confidentiality. Persons who live in Sudan, of any age group, who had read and understood the post, and accepted to participate in the study were directed to fill the questionnaire via clicking the link.

2.2. Measures

The self-administered online questionnaire contained two parts: demographics variables which are: gender, age, marital status, education, occupation, and place of current residence. And questions about knowledge, attitude, and practices towards COVID-19.

Knowledge part had 17 questions: 9 regarding clinical presentations, 3 regarding transmission routes, and 5 regarding prevention and control of COVID-19 (Table 1).

Attitudes towards COVID-19 were measured by 3 questions: about the thinking on the control of COVID-19 successfully, the belief in winning against COVID-19 and adherence to the decision of staying at home. The practices of participants were evaluated by 4 actions: going to a crowded area, wearing a mask when going out in last few days, using tissues when coughing or sneezing, and washing hands with soap and water or using antiseptic.

All questions were answered on a Yes/No basis.

2.3. Data analysis

Data analyses were conducted with SPSS. Frequencies of correct knowledge answers and different attitudes and practices were described. Multivariable linear regression analysis using all of the demographic variables as independent variables and knowledge score as the outcome variable was conducted to determine factors related to knowledge. Similarly, binary logistic regression analyses were used to determine factors related to attitudes and practices.

3. Results

A total of 2,336 participants completed the study questionnaire. Within this population, 1,552 (66.4%) were between 18 and 29 years old, 1,418 (60.7%) were ladies, 1,773 (75.9%) have a high school education, and 1,778 (76.1%) were Khartoum citizens. Other demographic features are including in Table 2.

The mean COVID-19 knowledge score was 14.41 (SD: 1.54, range: 0-17), indicating a general 84.7% (14.41/17*100) correct rate on this knowledge test. Knowledge scores considerably varied‘ ‘ among genders, age-groups, classes of marital status, education levels, occupation, and residence places (Table 2).

According to demographic features: male gender, age of 17 or less, marital status of others, education of primary school or lower, occupation of free work, and residence of outside Khartoum were related to lower knowledge score.

Table 1: Questionnaire of knowledge, attitudes, and practice towards COVID-19.

Questions	Options
K1. Is fever one of the main clinical symptoms of COVID-19? ()	Yes, No
K2. Is fatigue one of the main clinical symptoms of COVID-19?	Yes, No
K3. Is dry cough one of the main clinical symptoms of COVID-19?	Yes, No
K4. Is myalgia one of the main clinical symptoms of COVID-19?	Yes, No
K5. Is diarrhea one of the main clinical symptoms of COVID-19?	Yes, No
K6. Is eyes congestion one of the main clinical symptoms of COVID-19?	Yes, No
K7. Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus.	Yes, No
K8. Till now there is no definite treatment for COVID-2019, but early symptomatic and supportive management may assist most patients to recover from the infection.	Yes, No
K9. Not all people with COVID-2019 will reach to severe stages. Only old persons, those who have chronic diseases, and obese are highly susceptible to severe stages.	Yes, No
K10. Eating or handling wild animals would lead to infection by the COVID-19 virus.	Yes, No
K11. People with COVID-2019 cannot transmit the infection to others if they had no fever.	Yes, No
K12. The COVID-19 virus transmits via respiratory droplets from sick persons.	Yes, No
K13. Normal people can wear general medical masks to prevent the infection by the COVID-19 virus.	Yes, No
K14. Children and youths do not have to take actions to inhibit the infection by the COVID-19 virus.	Yes, No
K15. To inhibit the infection by COVID-19, peoples must avoid going to crowded places such as train stations and avoid using public transportations.	Yes, No
K16. Isolation and treatment of sick people with the COVID-19 virus are useful ways to decrease the expansion of the virus.	Yes, No
K17. Persons who have contact with individual infected with the COVID-19 virus must be isolated in a suitable area immediately. Generally, the observation period is 14 days.	Yes, No
Attitudes A1. Do you think that COVID-19 will be successfully controlled?	Yes, No
A2. Do you believe that Sudan can win against the COVID-19 virus?	Yes, No
A3. Are you ready to commit (adhere) to the decision of staying at home?	Yes, No
Practices P1. In the last few days, have you gone to any crowded area?	Yes, No
P2. In the last few days, have you worn a mask when leaving home?	Yes, No
P3. When coughing or sneezing do you use the tissue?	Yes, No
P4. Do you wash your hands frequently or using the antiseptic before touching your face?	Yes, No

Most of the respondents thought that COVID-19 will be successfully controlled (85.1%). The attitude towards the success in controlling COVID-19 considerably varied among genders and residence places. (OR 1.381 (1.098, 1.737) 1.568 (1.168, 2.105)) sequentially (Table 3).

The percentage of those who had to believe that Sudan will successfully cope with COVID-19 is 60.9%. (OR 1.296 (1.151, 1.459) 1.118 (1.049, 1.192)) sequentially (Table 4).

Nearly all the participants (94.8%) were ready to commit to the decision of staying at home. The attitude towards this question considerably varied among genders (OR 3.206 (2.179, 4.717) (Table 5).

60.9% of respondents had not visited any crowded area however 49.3% wore masks when going outside in the days immediately prior to their taking the survey. There was still a significant portion of the respondents who had visited crowded areas (30.1%) and had not worn masks when leaving home (50.7%), (Tables 6 and 7).

Result analysis showed that gender, marital status, occupation, and residence (0.570 (0.477,0.682), 1.202 (1.011,1.430), 1.129 (1.056,1.206), 0.777 (0.627,0.962)) sequentially had a significant impact on the tendency to go to a crowded area. Occupation and education (OR 1.115 (1.001, 1.241), 1.087 (1.022, 1.156)) sequentially appear to be less of a factor in the decision to not wear a mask outside.

Also, a large portion of participants (86.6%) used tissues when coughing or sneezing, and (92%) frequently washed their hands or used antiseptic. The rates of these two practices considerably varied among demographic classes (Tables 8 and 9).

4. Discussion

According to our information this is the first study in Sudan measuring the KAP towards COVID-19 among Sudan citizens. In this preponderantly female, young, unmarried and moderately educated population, we found a general correct rate of 84.7% on the knowledge test, indicating that majority of participants have good knowledge about COVID-19.

Almost all the participants also display a positive attitude towards the COVID-19 epidemic: 85.1% thought that COVID-19 will be successfully controlled; 60.9% consider Sudan will defeat the virus; 94.8% were ready to commit to the decision of staying at home.

Despite this, the practices of Sudan citizens were different, we found that 69.9% avoided crowded areas, only 49.3% wore masks when leaving the home, 86.6% used tissues when coughing or sneezing, 92% frequently washed their hands or used antiseptic throughout the interval of the COVID-19 pandemic.

We additionally analyzed the features of KAP towards COVID-19 and identified some demographic factors related to KAP; these findings are helpful for public health policy-makers and health workers to identify target populations for COVID-19 prevention and health education [2].

A high correct rate of COVID-19 knowledge in Sudan citizens was predictable as we conducted this study some time after the pandemic started, giving time for knowledge

Table 2: Demographic features of participants and the knowledge score of COVID-19 by demographic variables. (n= 2336).

Characteristics		Number of participants	Knowledge score(mean±SD)	T/F	P
Gender	Male	918 (39.3%)	14.19±1.63	-5.54	0.00*
	Female	1418 (60.7%)	14.55±1.46		
Age	<=17	64 (2.7)	13.44±2.14	8.66	0.00*
	18-29	1525 (66.4)	14.40±1.49		
	30-40	530 (22.7)	14.54±1.51		
	41-50	137 (5.9)	14.62±1.40		
	>=51	53 (2.3)	14.08±2.12		
Marital status	Married	713 (30.5)	14.53±1.54	3.12	0.04*
	Unmarried	1547 (66.2)	14.37±1.50		
	Others**	76 (3.3)	14.24±2.12		
Education	Primary school or lower	14 (0.6)	12.71±2.52	26.69	0.00*
	Secondary school	1773 (75.9)	14.44±1.46		
	Bachelor	171 (7.3)	13.61±1.85		
	Master or higher	378 (16.2)	14.71±1.56		
Occupation	Student	880 (37.7)	14.30±1.47	3.62	0.01*
	Employee	214 (9.2)	14.39±1.84		
	Housewife	801 (34.3)	14.56±1.48		
	Unemployed	226 (9.7)	14.46±1.65		
	Free work	215 (9.2)	14.29±1.53		
Current residence	Khartoum	1778 (76.1)	14.46±1.50	2.79	0.01*
	Outside Khartoum	558 (23.9)	14.25±1.63		
		Total 2336 (100)	14.41±1.54		

***significant association **others include: divorced, engaged, and suttee.**

about the virus and countermeasures to be disseminated amongst the population. The seriousness of the situation ensured widespread TV coverage in addition to guidance made publicly available on the WHO website and the national campaigns for public education.

Comparing our findings with a cross-sectional KAP study towards COVID-19 among Chinese residents [2], we found most Chinese respondents were knowledgeable about COVID-19 (90% correct rate), slightly higher than the 84.7% rate in the respondents to our study. They had an optimistic attitude towards the COVID-19 pandemic: 90.8%

Table 3: Attitudes towards COVID-19 by demographic variables, (do you think that COVID-19 will be successfully controlled?) (n=2336).

Characteristics		Yes	No	OR (95% CI)
Gender	Male	758 (32.4)	160 (6.8)	1.381(1.098,1.737)*
	Female	1230 (52.7)	188 (8.0)	
Age	<=17	53 (2.3)	11 (0.5)	1.171 (0.993,1.380)
	18-29	1310 (56.1)	242 (10.4)	
	30-40	457 (19.6)	73 (3.1)	
	41-50	119 (5.1)	18 (0.8)	
	>=51	29 (2.4)	4 (0.2)	
Marital status	Married	616 (26.4)	97 (4.2)	0.951 (0.761,1.188)
	Unmarried	1302 (55.7)	245 (10.5)	
	Others**	70 (3.0)	6 (0.3)	
Education	Primary school or lower	10 (0.4)	4 (0.2)	1.012 (0.870,1.177)
	Secondary school	1511 (64.7)	262 (11.2)	
	Bachelor	145 (6.2)	26 (1.1)	
	Master or higher	322 (13.8)	56 (2.4)	
Occupation	Student	738 (31.6)	142 (6.1)	1.041 (0.954,1.136)
	Employee	185 (7.9)	29 (1.2)	
	Housewife	686 (29.4)	115 (4.9)	
	Unemployed	198 (8.5)	28 (1.2)	
	Free work	181 (7.7)	34 (1.5)	
Current residence	Khartoum	1491 (63.8)	287 (12.3)	1.568 (1.168,2.105)*
	Outside Khartoum	497 (21.3)	61 (2.6)	
		1988 (85.1)	348 (14.9)	

***significant association** ****others include: divorced, engaged, and suttee.**

believed that COVID-19 will finally be successfully controlled, and 97.1% had confidence that China could defeat the virus. Chinese respondents were very cautious: nearly all avoided crowded areas (96.4%) and wore masks when leaving the home (98.0%) much higher figures than we found in the Sudanese survey.

Although the Sudan government has made worthy efforts to control the virus outbreak, an unprepared country such as Sudan cannot mobilize an efficient national response. This is also true of neighboring countries in Africa, further facilitating the spread of the disease. Matters are complicated in Sudan by the grinding poverty, lack of household savings to offset lost income, lack of access to clean water, proper sanitation, and health supplies and the millions who are living in displaced person

Table 4: Attitudes towards COVID-19 by demographic variables, (do you have to believe that Sudan can win against the COVID-19 virus?) (n=2336).

Characteristics		Yes	No	OR (95% CI)
Gender	Male	561 (24.0)	357 (15.3)	0.990 (0.835,1.173)
	Female	863 (36.9)	555 (23.8)	
Age	<=17	34 (1.5)	30 (1.3)	1.296 (1.151,1.459)*
	18-29	912 (39.0)	640 (27.4)	
	30-40	341 (14.6)	189 (8.1)	
	41-50	95 (4.1)	42 (1.8)	
	>=51	42 (1.8)	11 (0.5)	
Marital status	Married	455 (19.5)	258 (11.0)	0.850(0.722,1.000)
	Unmarried	926 (39.6)	621 (26.6)	
	Others**	43 (1.8)	33 (1.4)	
Education	Primary school or lower	7 (0.3)	7 (0.3)	1.087(0.973,1.215)
	Secondary school	1071 (45.8)	702 (30.1)	
	Bachelor	102 (4.4)	69 (3.0)	
	Master or higher	244 (10.4)	134 (5.7)	
Occupation	Student	502 (21.5)	378 (16.2)	1.118 (1.049,1.192)*
	Employee	136 (5.8)	78 (3.3)	
	Housewife	493 (21.1)	308 (13.2)	
	Unemployed	142 (6.1)	84 (3.6)	
	Free work	151 (6.5)	64 (2.7)	
Current residence	Khartoum	1077 (46.1)	701 (30.0)	1.070 (0.880,1.302)
	Outside Khartoum	347 (14.9)	211 (9.0)	
		1424 (61)	912 (39)	

***significant association** ****others include: divorced, engaged, and suttee.**

camps across Darfur where COVID-19 might spread rapidly with devastating results. Additionally, the unprecedented demand on an inadequate health care system (with only eighty ventilators and two hundred intensive care hospital beds) could well presage its collapse. Even government-run containment facilities cannot look after the sick for the required fourteen-day quarantines [6]. These factors contribute to the results of our survey. In particular, we draw attention to increasingly popular conviction that Sudan's high daily temperatures and young population will ensure the country avoids the worst effects of the disease. The young are displaying a tendency to perceive themselves as impervious to the disease. While this is not an uncommon response (the same conviction

Table 5: Attitudes towards COVID-19 by demographic variables, (Are you ready to commit to the decision of staying at home?) (n=2336).

Characteristics		Yes	No	OR (95% CI)
Gender	Male	838 (35.9)	80 (3.4)	3.206 (2.179,4.717)*
	Female	1377 (58.9)	41 (1.8)	
Age	<=17	59 (2.5)	5 (0.2)	1.098 (0.847,1.423)
	18-29	1474 (63.1)	78 (3.3)	
	30-40	499 (21.4)	31 (1.3)	
	41-50	131 (5.6)	6 (0.3)	
	>=51	52 (2.2)	1 (0.0)	
Marital status	Married	687 (29.4)	26 (1.1)	0.641 (0.443,0.928)*
	Unmarried	1458 (62.4)	89 (3.8)	
	Others**	70 (3.0)	6 (0.3)	
Education	Primary school or lower	12 (0.5)	2 (0.10	1.280 (0.971,1.687)
	Secondary school	1675 (71.7)	98 (4.20	
	Bachelor	164 (7.0)	7 (0.3)	
	Master or higher	364 (15.6)	14 (0.6)	
Occupation	Student	837 (35.8)	43 (1.8)	0.905 (0.790,1.037)
	Employee	208 (8.9)	6 (0.3)	
	Housewife	757 (32.4)	44 (1.9)	
	Unemployed	214 (9.2)	12 (0.5)	
	Free work	199 (8.5)	16 (0.7)	
Current residence	Khartoum	1689 (72.3)	89 (3.8)	0.866 (0.572,1.313)
	Outside Khartoum	526 (22.5)	32 (1.4)	
		2215 (94.8)	121 (5.2)	

***significant association** ****others include: divorced, engaged, and suttee.**

is visible in other countries) it is a potentially devastating one in a country like Sudan where different ages of people live under one roof [6].

The present study showed that 30.1% of citizens went to crowded areas and 50.7% did not wear masks when leaving homes in the days immediately prior to taking the survey, 13.3% did not use tissues and 8% did not wash their hands frequently. These potentially risky behaviors were most likely to be displayed by unmarried male gender of 29 years or less, with secondary school education or less, and poor COVID-19 knowledge. This correlates with findings from previous studies regarding age and gender patterns of risk-taking behaviors [2]. The considerably higher risk of practices among males could be ascribed to the need for working daily for the sake of living.

Table 6: Practices towards COVID-19 by demographic variables, (In the last few days, have you gone to any crowded area?) (n=2336).

Characteristics		Yes	No	OR (95% CI)
Gender	Male	343 (14.7)	575 (24.6)	0.570 (0.477,0.682)*
	Female	360 (15.4)	1058 (45.3)	
Age	<=17	15 (0.6)	49 (2.1)	0.939 (0.832,1.061)
	18-29	481 (20.6)	1071 (45.8)	
	30-40	161 (6.9)	369 (15.8)	
	41-50	30 (1.3)	107 (4.6)	
	>=51	16 (0.7)	37 (1.6)	
Marital status	Married	188 (8.0)	525 (22.5)	1.202 (1.011,1.430)*
	Unmarried	495 (21.2)	1052 (45.0)	
	Others**	20 (0.9)	65 (2.4)	
Education	Primary school or lower	3 (0.1)	11 (0.5)	0.935 (0.830,1.052)
	Secondary school	546 (23.4)	1227 (52.5)	
	Bachelor	49 (2.1)	122 (5.2)	
	Master or higher	105 (4.5)	273 (11.7)	
Occupation	Student	238 (10.2)	642 (27.5)	1.129 (1.056,1.206)*
	Employee	38 (1.6)	176 (7.5)	
	Housewife	280 (12.0)	521 (22.3)	
	Unemployed	72 (3.1)	154 (6.6)	
	Free work	75 (3.2)	140 (6.0)	
Current residence	Khartoum	557 (23.8)	1221 (52.3)	0.777 (0.627,0.962)*
	Outside Khartoum	146 (6.3)	412 (17.6)	
		703 (30.1)	1633 (69.9)	

***significant association **others include: divorced, engaged, and suttee.**

We noticed that higher COVID-19 knowledge scores were found to be considerably associated with a lower likelihood of potentially dangerous practices towards the COVID-19 pandemic in our study. This indicates the importance of enhancing citizens' COVID-19 knowledge via health education, which can also result in improved practices relating to COVID-19. We recommend that the health education intervention targets certain demographic groups such as males, young aged and people with a low level of education.

We considered that poor knowledge, defeatist attitudes, and unacceptable practices relating to COVID-19 prevention are strongly associated with limited access to the internet and online health information resources, vulnerable populations such as

Table 7: Practices towards COVID-19 by demographic variables, (In the last few days, have you worn a mask when leaving home?) (n=2336).

Characteristics		Yes	No	OR (95% CI)
Gender	Male	437 (18.7)	481 (20.6)	1.123 (0.951, 1.326)
	Female	716 (30.7)	702 (30.1)	
Age	<=17	31 (1.3)	33 (1.4)	1.052 (0.943, 1.175)
	18-29	755 (32.3)	797 (34.1)	
	30-40	271 (11.6)	259 (11.1)	
	41-50	68 (2.9)	69 (2.9)	
	>=51	28 (1.2)	28 (1.2)	
Marital status	Married	359 (15.4)	354 (15.2)	0.977 (0.834 ,1.144)
	Unmarried	753 (32.2)	794 (34.0)	
	Others**	41 (1.8)	35 (1.5)	
Education	Primary school or lower	4 (0.2)	10 (0.4)	1.115 (1.001, 1.241)*
	Secondary school	853 (36.5)	920 (39.4)	
	Bachelor	101 (4.3)	70 (3.0)	
	Master or higher	195 (8.3)	183 (7.8)	
Occupation	Student	399 (17.1)	481 (20.6)	1.087 (1.022, 1.156)*
	Employee	82 (3.5)	132 (5.7)	
	Housewife	468 (20.0)	333 (14.3)	
	Unemployed	94 (4.0)	132 (5.7)	
	Free work	110 (4.7)	105 (4.5)	
Current residence	Khartoum	865 (37.0)	913 (39.1)	1.126 (0.931, 1.362)
	Outside Khartoum	288 (12.3)	270 (11.6)	
		1153(49.3)	1183(50.7)	

***significant association **others include: divorced, engaged, and suttee.**

older adults and rural people. Therefore, KAP towards COVID-19 among vulnerable populations needs special research attention.

In summary, our findings suggest that Sudan citizens of a relatively young age, in particular ladies, have had good knowledge, hopeful attitudes, and acceptable practices towards COVID-19 throughout the interval of the COVID-19 pandemic. Also, good COVID-19 knowledge is associated with acceptable practices towards COVID-19, suggesting that health education programs aimed at enhancing COVID-19 knowledge help encourage and keep safe practices. Finally, with additional national efforts toward public

Table 8: Practices towards COVID-19 by demographic variables, (When coughing or sneezing do you use the tissue?) (n=2336).

Characteristics		Yes	No	OR (95% CI)
Gender	Male	737 (31.5)	181 (7.7)	2.413 (1.893,3.075)*
	Female	1287 (55.1)	131 (5.6)	
Age	<=17	52 (2.2)	12 (0.5)	1.635 (1.338,1.998)*
	18-29	1309 (56.0)	243 (10.4)	
	30-40	486 (20.8)	44 (1.9)	
	41-50	127 (5.4)	10 (0.4)	
	>=51	50 (2.1)	3 (0.1)	
Marital status	Married	663 (28.4)	50 (2.1)	0.538 (0.421,0.688)*
	Unmarried	1292 (55.3)	255 (10.9)	
	Others**	69 (3.0)	7 (0.3)	
Education	Primary school or lower	13 (0.6)	1 (0.0)	1.340 (1.119,1.605)*
	Secondary school	1514 (64.8)	259 (11.1)	
	Bachelor	150 (6.4)	21 (0.9)	
	Master or higher	347 (14.9)	31 (1.3)	
Occupation	Student	723 (31.0)	157 (6.7)	1.124 (1.025,1.234)*
	Employee	196 (8.4)	18 (0.8)	
	Housewife	734 (31.4)	67 (2.9)	
	Unemployed	188 (8.0)	38 (1.6)	
	Free work	183 (7.8)	32 (1.4)	
Current residence	Khartoum	1551 (66.4)	227 (9.7)	0.814 (0.622,1.067)
	Outside Khartoum	473 (20.2)	85 (3.6)	
		2024(86.6)	312(13.3)	

***significant association** ****others include: divorced, engaged, and suttee.**

education and researches about COVID-19 Sudan will successfully control and prevent COVID-19.

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Table 9: Practices towards COVID-19 by demographic variables, (Do you wash your hands frequently or using the antiseptic before touching your face?) (n=2336).

Characteristics		Yes	No	OR (95% CI)
Gender	Male	809 (34.6)	109 (4.7)	2.346 (1.730,3.182)*
	Female	1341 (57.4)	77 (3.3)	
Age	<=17	56 (2.4)	8 (0.3)	1.480 (1.159,1.888)*
	18-29	1412 (60.4)	140 (6.0)	
	30-40	501 (21.4)	29 (1.2)	
	41-50	130 (5.6)	7 (0.3)	
	>=51	51 (2.2)	2 (0.1)	
Marital status	Married	674 (28.9)	39 (1.7)	0.667 (0.494,0.902)*
	Unmarried	1406 (60.2)	141 (6.0)	
	Others**	70 (3.0)	6 (0.3)	
Education	Primary school or lower	12 (0.5)	2 (0.1)	1.301 (1.037,1.631)*
	Secondary school	1621 (69.4)	152 (6.5)	
	Bachelor	159 (6.8)	12 (0.5)	
	Master or higher	358 (15.3)	20 (0.9)	
Occupation	Student	799 (34.2)	81 (3.5)	0.942 (0.842,1.054)
	Employee	206 (8.8)	8 (0.3)	
	Housewife	760 (32.5)	41 (1.8)	
	Unemployed	197 (8.4)	29 (1.2)	
	Free work	188 (8.0)	27 (1.2)	
Current residence	Khartoum	1643 (70.3)	135 (5.8)	0.817 (0.583,1.144)
	Outside Khartoum	507 (21.7)	51 (2.2)	
		2150(92)	186(8)	

***significant association **others include: divorced, engaged, and suttee.**

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