Sudan Journal of Medical Sciences
Volume 16, Issue no. 2, DOI 10.18502/sjms.v16i2.9287
Production and Hosting by Knowledge E

Research Article

Knowledge and Practice Regarding Coronavirus Disease Prevention (COVID-19) Among Internally Displaced Persons in Camps in Central Darfur Region, Sudan

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Received 11 April 2021
Accepted 3 May 2021
Published 30 June 2021

Production and Hosting by Knowledge E

Editor-in-Chief:
Prof. Mohammad A. M. Ibnouf

OPEN ACCESS

Abstract

Background: The lacking healthcare system services in conflict areas and the emergence of infection with a pandemic of coronavirus disease may exacerbate the humanitarian crisis among the camp residents in the central Dafur region of Sudan. Adequate knowledge and practices are vital to prevent coronavirus disease 2019 (COVID-19). Therefore, this study aimed to investigate the knowledge and practice regarding COVID-19 among internally displaced persons in Sudan.

Methods: In this cross-sectional study, data were collected through an online survey using a self-administered questionnaire. Convenience sampling method was used for the internally displaced persons in two camps of Zalingei town, central Darfur region, Sudan.
Results: In total, 143 participants responded; 75 (52.4%) of them were female, while 68 (47.6%) were male; 49 (34.3%) were between the age of 50 and 60 years; 78 (54.5%) were formally uneducated; 126 (88.1%) did not have a chronic disease; and 56 (39.2%) knew about COVID-19 from their relatives and friends. The overall mean of participants' knowledge toward COVID-19 was 3.68 (SD ± 0.60(, denoting good with a rate of 73.6% and that of the practice was 2.65 (SD ±1.08), denoting moderate with a rate of 53%. A positive correlation was seen between knowledge and practice (r = 0.700, $p < 0.000$). Statistically significant differences were observed between the mean score of knowledge and practice with age, education, and information sources ($p < 0.0001$). While graduates showed a higher knowledge (116.29, p = 0.000), secondary respondents showed a higher practice (115.04, p = 0.000) than others.
Conclusion: This study suggests educational intervention and awareness programs for uneducated and older people.

Keywords: Darfur, camp residents, knowledge, practical measures, COVID-19

1. Introduction

The coronavirus disease 2019 (COVID-19) is continuously introducing change in our lifestyle. Recently, it has had considerable effects on global health, economic, and social aspects [1]. The pandemic has led to the cause of morbidity and mortality worldwide [2]. Coronaviruses are a large family of viruses and exist in both animals and humans. The viruses could cause illnesses ranging from the common cold to severe diseases such as severe acute respiratory syndrome (SARS) observed in November 2002 and the Middle East respiratory disorder (MERS) that emerged in September 2012 and transmitted from camels [3, 4]. In December 2019, Wuhan city of China reported a new strain of coronavirus disease, recognized as the COVID-19 virus. On March 11, 2020, WHO confirmed it as a global pandemic [5].

To date, many coronaviruses have appeared from animal reservoirs. The symptoms of COVID-19 include fever, dry cough, tiredness, muscle pain, and difficulty in breathing. Some patients complain of aches, runny nose, sore throat, and diarrhea, usually gradually. However, some individuals could also be asymptomatic. Approximately 80% of cases recover from the illness without needing specific treatment [6–8]. People with

diabetes, heart disease, respiratory disease, hypertension, or those aged >60 years are at greater risk of developing severe disease. The incubation period for the novel coronavirus is about 1–14 days, with an average of 5–6 days [4, 9, 10]. The COVID-19 virus is mainly transmitted through respiratory droplets. An infected person can transmit the disease by coughing, sneezing, or talking closely (within a distance of six feet) to another. Also, individuals may become infected by touching contaminated surfaces or objects and then touching their eyes, nose, or mouth. However, there is no evidence that the COVID-19 virus is transmitted through houseflies.

The preventive measures from infection frequently include handwashing with soap and water for least 20 sec or using an alcohol-based handrub, staying home/indoors, avoiding crowded places, avoiding touching mouth, eyes, or nose with dirty hands, covering mouth and nose with a disposable tissue when coughing or sneezing or using elbow if no tissue is available [11, 12]. Knowledge of the COVID-19 pathway and relevant precautions is essential in controlling the pandemic. Knowledge such as washing hands frequently or using alcohol-based handrub, wearing face masks, covering nose and mouth when coughing or sneezing, maintaining social distancing, and self-isolation when sick is crucial to reducing the widespread infection. Also, adequate knowledge motivates people to make quick decisions that may prevent and control epidemics [13]. Prompt preventive measures are necessary at the early stages of prevalence to protect against the disease spread. Knowledge and perceptions of people affect their behavior [14]. Determining public's opinion may prove crucial in determining the outcome of COVID-19 [15]

Some pieces of evidence have shown a deficit of knowledge, attitudes, and a lack of community practices regarding COVID-19 [16, 17]. In Sudan, authorities and health ministries are striving to reduce its widespread in all country borders. According to the Federal Ministry of Health of Sudan, the recent cases have continued to speed up in Sudan after the first COVID-19 case was confirmed on March 13, 2020, for a 50-year-old man who traveled from an Arabic country (18). Most people affected by the war live in the bare region; they have difficulty accessing health information. Also, there is little information about the new disease's knowledge and practical measures among internally displaced persons. Besides, it shows limited studies in Sudan to explore internally displaced persons' knowledge and practice (KP) regarding COVID-19. Therefore, our current study aimed to first investigate the KP regarding COVID-19 prevention among internally displaced persons in Sudan. Second, to check the correlation between KPs of the study variable. And third, to find out any differences within demographic variables and KPs of the study population.

2. Materials and Methods

2.1. Study design, setting, and population

This cross-sectional and community-based study was conducted to investigate the KP regarding COVID-19 prevention among internally displaced persons in two camps (Hamadiya and El HassaHissa camps) of central Darfur around Zalingei city, Sudan between April 4, 2020 and May 1, 2020. Darfur region lies in western Sudan, which is approximately 493,180 km^2 in area and has a population of nearly six million. It comprises of the states of North, West, South, East, and Central Darfur. However, since the breaking out of the conflict in 2003, around 1.9 million people have been internally displaced people (IDP), and nearly 60% of them are children living in camps as a result of the war conflict [19]. The internal conflicts affected the healthcare system's services reported by the United Nations, which left a vast humanitarian crisis around over one million internally displaced people in the Darfur region. In addition, there is a shortage of primary, secondary, and tertiary healthcare for pregnant women, children aged <5 years, those who lost their families, breastfeeding women, and elderly people [21]. Zalingei city is in the central Darfur region and is one of the urban areas surrounded by three camps of IDP: the Hesahesa, the Al Hamedia plus the Teyba, as a result of the war conflict [20]. The Hesahesa and the Al Hamedia camps are bigger than others and close to Zalingei city.

2.2. Sample size and technique

We used both manual and online google forms for data collection through convenience sampling and snowball sampling. We trained two data collectors who were nurses with a diploma. In the manual method of data collection, we maintained protective measures of COVID-19, such as social distancing and wearing a face mask during data collection. In the online method, we distributed google forms link through social networking platforms such as WhatsApp groups in the camps. Initially, data for 159 people were collected through nonprobability sampling, but only 143 eligible participants meeting the inclusion criteria were included in the survey.

2.3. Inclusion and exclusion criteria

Those participants who were willing to join the survey were included, while those who were unwilling to participate, were a non-resident of the camps, and those who pretested in the pilot test were excluded.

2.4. Data collection instrument

The researchers developed a questionnaire in the English language from a literature review based on guidelines [22–24]. We created an Arabic version of the original questionnaire and back-translated it into English for validity by three experts in the English language to match the original questionnaire. The researchers administered the final Arabic questionnaire to participants because the Arabic language is the primary language in Sudan. The researchers conducted a pilot study on 10 participants. According to pretest findings, the researchers made corrections for the feasibility, content applicability, and duration before starting the actual data collection phase—the participants of the pilot study were excluded from the actual study. We conducted the reliability test for internal consistency, and it was good. The Cronbach's alpha coefficient of the tool assessing KPs regarding COVID-19 was 0.879 and 0.924, respectively. As a thumb rule, values <0.6 are considered poor, 0.6–0.7 are acceptable, and >0.7 are good.

The questionnaire comprised of three parts. Part one included seven demographic variables: gender, age, education level, previous disease, tobacco use, the camp resident's name, and information sources. The second part comprised of 10 questions assessing the respondent's knowledge related to COVID-19 based on a five-point Likert-type scale to measure the level of knowledge as follows: always true (5 points), usually true (4 points), neutral (3 points), rarely true (2 points), and never true (1 point). Part three comprised of 10 items of practice toward preventive measures against COVID-19. Every question was rated on a 5-point Likert scale to measure the level of practice ranging from never do (1 point), rarely do (2 points), sometimes do (3 points), often do (4 points), and always do (5 points). The total mean scores of all answers in KP were computed. While scores above the mean score indicated high KP, scores lower than mean scores indicated low KP. The total scores of KPs were converted into percentages by dividing the total obtained score of each part by the same part's maximum score and multiplied by a 100.

We used a five-point Likert scale with intervals created with the majority of the differences being constant (0.79) except for the last one that is wider and has a slighter difference of (0.1) among the rest [25]. The Likert scale is explained as follows:

1 = 1.00–1.79 = never

2 = 1.80–2.59 = rare

3 = 2.60–3.39 = sometimes

4 = 3.40–4.19 = often

5 = 4.20–5.00 = always

2.5. Statistical analysis

We used a statistical package of social sciences (SPSS) version 25 to analyze this study, including descriptive statistics and inferential statistics. The non-parametric tests (Mann–Whitney U-test, Kruskal–Wallis, and Spearman correlation coefficient) were conducted to analyze the data because the Kolmogorov–Smirnov test abnormally distributed the data preliminarily. The significance level was at < 0.05.

3. Results

3.1. Demographic characteristics

In this study, 143 participants responded to the survey. The majority, that is, 75 (52.4%) of them were female, while 68 (47.6%) were male; 49 (34.3%) of them were ages between 50 and 60 years; 78 (54.5%) were formally uneducated; 126 (88.1%) of them did not have a chronic disease; and 56 (39.2%) knew about COVID-19 from their relatives and friends, as shown in Table 1.

3.2. Assessment of knowledge toward COVID-19

The current results showed that more than half (51.7%) of the participants neutrally responded that coronaviruses are a large group of viruses and may cause disease in animals and humans. However, less than half of the participants answered correctly about the type and origin of the infection (43.4%) and its signs and symptoms (42.7%). Also, nearly half of them responded neutrally about the transmission (42.7%), the incubation period of COVID-19 (47.6%), no definite treatment (49.0%). Besides, about half of the participants answered correctly about the effective ways to reduce the spread of

Table 1: Distribution of demographic characteristics of the participants (n = 143).

Variable	Frequency	Percentage
Gender		
Male	68	47.6
Female	75	52.4
Age (yr)		
<20	6	4.2
20–30	24	16.8
30–40	22	15.4
50–60	49	34.3
>60	42	29.4
Education level		
Formally uneducated	78	54.5
Primary	34	23.8
Secondary	14	9.8
Graduate	17	11.9
Do you have asthma, diabetes, or heart disease?		
Yes	17	11.9
No	126	88.1
Do you smoke?		
Yes	11	7.7
No	132	92.3
Source of information		
Radio	25	17.5
Television	11	7.7
Health workers	14	9.8
Workers in humanitarian aid organizations	7	4.9
Relatives and friends	56	39.2
Mosque	20	14.0
Social media, Facebook, WhatsApp	10	7.0

the virus (42.7%), agreed that avoiding crowded places is an effective way to reduce the spread of the disease (40.6%), and that the new coronavirus disease may lead to death (48.3%). The overall mean score of respondents' knowledge was 3.69 (SD = 0.60, range: 1–5) denoting good with a rate of 73.8% (3.69/5*100) about COVID-19, as shown in Table 2.

3.3. Assessment of practice toward prevention of COVID-19

Answers related to practice toward preventing COVID-19 showed that 52 (36.4%) participants did not practice frequent handwashing, 39 (27.3%) did not refrain from touching

Table 2: Distribution of participants' Knowledge regarding COVID-19 (n = 143).*

Questions	Frequency (%)*				
	Always true	Usually true	Neutral	Rarely true	Never true
Coronaviruses are a large group of viruses that may cause disease in animals and humans?	21 (14.7%)	45 (31.5%)	74 (51.7%)	2 (1.4%)	1 (0.7%)
The new corona disease is an infectious disease discovered in the Chinese city of Wuhan?	30 (21.0%)	62 (43.4%)	46 (32.2%)	0 (0.0%)	5 (3.5%)
The symptoms of coronavirus disease are fatigue, dry cough, and fever?	36 (25.2%)	61 (42.7%)	41 (28.7%)	4 (2.8%)	1 (0.7%)
Coronavirus transmission occurs through direct contact with droplets dispersed from an infected person, touching contaminated surfaces, and then touching the eyes, nose, and mouth?	23 (16.1%)	49 (34.3%)	61 (42.7%)	7 (4.9%)	3 (2.1%)
The incubation period of coronavirus disease ranges from one to fourteen days?	23 (16.6%)	44 (30.8%)	68 (47.6%)	5 (3.5%)	3 (2.1%)
The elderly and people with high blood pressure, heart disease, lung disease, cancer, or diabetes are more likely to develop severe complications?	30 (21.0%)	56 (39.2%)	51 (35.7%)	0 (0.0%)	6 (4.2%)
There is currently no definite treatment that can prevent or treat the new coronavirus disease?	23 (16.1%)	35 (24.5%)	70 (49.0%)	14 (9.8)	1(0.7%)
Isolating infected people is one of the effective ways to reduce the spread of the virus?	24 (16.8%)	61 (42.7%)	49 (34.3%)	6 (4.2%)	3 (2.1%)
Avoiding going to crowded places is an effective way to reduce the spread of the disease?	31 (21.7%)	58 (40.6%)	46 (32.2%)	5 (3.5%)	3 (2.1%)
The new coronavirus disease may lead to death?	33 (23.1%)	69 (48.3%)	34 (23.8%)	5 (3.5%)	2 (1.4%)
Overall mean score				**3.69 (SD =± 0.60)**	**73.8%**

Note: *The frequency and percentages are based on n =143. SD: standard deviation. 5-point Likert scale (range 1–5), mean score 1–2.59 denotes low, 2.60–3.39 denotes moderate, and 3.40–5 denotes high knowledge.

their eyes or nose, and 47 (32.9%) never covered their mouth and nose with an elbow or tissue when coughing or sneezing. Additionally, 52 (36.4%) of them answered that they never maintained a distance of 3 feet, 51 (35.7%) did not follow the "staying at home

Table 3: Frequency of practice responses regarding COVID-19 (n = 143).*

	***N* (%)**				
Questions	**Always**	**Often**	**Sometimes**	**Seldom**	**Never**
Do you frequently clean hands using alcohol-based hand rub or soap and water; after contact or doing anything?	13 (9.1)	29 (20.3)	43 (30.1)	6 (4.2)	52 (36.4)
Do you try to avoid touching your eyes, nose with your unclean hand?	14 (9.8)	36 (25.2)	38 (26.6)	16 (11.2)	39 (27.3)
Do you try to cover your mouth and nose with a flexed elbow or a tissue when coughing and sneezing?	13 (9.1)	23 (23.1)	32 (22.4)	18 (12.6)	47 (32.9)
Do you maintain at least 3 feet distance between yourself and anyone who is coughing or sneezing?	15 (10.5)	26 (18.2)	24 (16.8)	26 (18.2)	52 (36.4)
Do you stay at home and limit going out as necessary?	11 (7.7)	30 (21.0)	26 (18.2)	25 (17.5)	51 (35.7)
Do you try to avoid shaking hands when you meet your relatives?	12 (8.4)	22 (15.4)	29 (20.3)	19 (13.3)	61 (42.7)
Do you attempt to avoid sharing objects that touch your mouths, such as cups, dishes, and bottles?	10 (7.0)	37 (25.9)	23 (16.1)	17 (11.9)	56 (39.2)
Do you wear a mask all time if you have symptoms of fever, cough, and difficulty breathing?	21 (14.7)	17 (11.9)	15 (10.5)	15 (10.5)	75 (52.4)
Do you try to avoid the consumption of undercooked animal products such as raw meat, milk, or animal organs?	65 (45.5)	40 (28.0)	13 (9.1)	8 (5.6)	17 (11.9)
Do you isolate yourself in the room from family if you have a headache and runny nose until you recover?	13 (9.1)	35 (24.5)	24 (16.8)	18 (12.6)	53 (37.1)
Overall mean score of practice				2.65 (SD =± 1.08)	53.0%

Note: *The frequency and percentages are based on n = 143. SD: standard deviation. 5-point Likert scale (range 1–5), mean score 1–2.59 denotes low, 2.60–3.39 denotes moderate, and 3.40–5 denotes good practice.

and limiting going out" protocol, 61 (42.7%) participants answered that they did not avoid shaking hands, and 56 (39.2%) practiced no measures to avoid sharing objects such as cups, dishes, and bottles. Also, 75 (52.4%) participants never wore a mask all time even if they had symptoms of fever, cough, and difficulty breathing and 53

Table 4: Normality test in the study sample (143).

Normal parameter	Overall mean score of knowledge	Overall mean score of practice	Asymp. Sig. (2-tailed)
Mean	3.6916	2.6538	0.002*
Standard Deviation	0.60041	1.08041	0.000*

Note: We used one-sample Kolmogorov–Smirnov Test. *Statically significant at *p*-value < 0.05.

Table 5: Correlation between knowledge and practice of the study variable.

Variable	Rho	P-value
Knowledge and practice	0.700**	0.000**

Note: Spearman's rho test was used. *Statically significant at *p*-values < 0.05.

(37.1%) participants never isolated themselves until recovery. However, nearly half of them responded always to avoid consuming undercooked animal products that is, 65 (45.5%). The overall mean score of respondents' practice was 2. 65 (SD =1. 08, range: 1–5), denoting moderate practice toward preventive measures against COVID-19 with a rate of 53% (2. 65 /5*100) regarding COVID-19 as shown in Table 3.

3.4. Normality test

In this, we used the Kolmogorov-Smirnov test to examine the normality of the data for the knowledge, practice (KP) of participants in the study sample. The current results revealed not normally distributed data in mean scores of KPM (p< 0.000) in table 4. Therefore, we adopted non-parametric tests to analyze the rest of the data.

3.5. Correlation between knowledge and practice (KP) of study variables

3.5.1. Testing correlation hypothesis

H0: There is no significant correlation between knowledge and practice of study variables.

H1: There is a significant correlation between knowledge and practice of study variables.

We tested the hypothesis of a correlation between knowledge and practice by Spearman's rho non-parametric test. We observed a strong correlation between knowledge and practice (r = 0.70**, p < 0.000). Therefore, the test that supported the alternative hypothesis is mentioned in Table 5.

Table 6: Comparison of mean scores of knowledge and practice with demographic characteristics (n = 143).

Variable	*N*	K-Average 3.69 ± 0.60 Mean rank	*P*-value	*N*	P- Average 2.65 ± 1.08 Mean rank	*P*-value
Gender						
Male	68	70.88	0.758	68	69.90	0.564
Female	75	73.01		75	73.90	
Age (yr)						
<20	6	117.83	0.000*	6	105.17	0.000*
20–30	24	107.69		24	98.79	
30–40	22	86.41		22	74.30	
50–60	49	63.31		49	67.29	
>60	42	47.65		42	56.25	
Education level						
Uneducated	78	45.78	0.000*	78	47.25	0.000*
Primary	34	92.85		34	94.82	
Secondary	14	113.68		14	115.04	
Graduate	17	116.29		17	104.47	
Do you have asthma, diabetes, heart disease?						
Yes	17	40.88	0.001	17	45.97	0.006
No	126	76.20		126	75.51	
Do you smoke?						
Yes	11	98.05	0.029	11	88.68	0.164
No	132	69.83		132	70.61	
Source of information						
Radio	25	85.52	0.000*	25	93.08	0.000*
Television	11	108.09		11	116.41	
Health workers	14	110.68		14	113.89	
Workers in humanitarian aid organizations	7	105.93		7	100.00	
Relatives and friends	56	45.91		56	41.50	
Mosque	20	48.88		20	59.95	
Social media, Facebook, WhatsApp	10	112.95		10	87.10	

Note: *Statically significant at –p-values < 0.05. We used non-parametric tests, Mann–Whitney U-test, Kruskal–Wallis test. K-Average: knowledge mean score; P- Average: practice mean score.

3.6. Compare mean scores of KP and demographic characteristics.

3.6.1. Testing differences hypothesis

H0: There are no significant differences between the knowledge and practice of IDPs with demographic characteristics.

H1: There are significant differences between the knowledge and practice of IDPs with demographic characteristics.

We compared the mean scores of knowledge and practice with each demographic characteristic to determine any differences within them. We used inferential statistics tests such as Mann–Whitney U-test for two independent groups and the Kruskal–Wallis test for more than two independent groups to compare mean scores of knowledge and practice variables with their demographic characteristics. We found significant differences between the mean scores of knowledge, practice, and all age groups. The participants that were aged <20 years (117.83) showed higher knowledge and practice than other age groups. Also, we observed a significant difference in educational level. Graduates (116.29) showed a statistically significantly higher average score of knowledge than other levels. Similarly, those with secondary education (115.04) showed a statistically significantly higher average score of practice. And accordingly, uneducated people exhibited significantly less knowledge (45.78) and practice (47.25), respectively. There was a significant difference between the mean score of knowledge with people who did not have medical disease and smokers and information source. Respondents who received their information from social media, Facebook, WhatsApp (112.95) showed higher knowledge than others, while respondents who received their information from television (116.41) showed significantly higher practice. However, we did not notice any statistically significant difference in the mean scores of the knowledge and practice with gender ($p > 0.05$) (Table 6).

4. Discussion

This study aimed to investigate the knowledge and practice of COVID-19 among IDPs in Sudan. The current study revealed that most respondents gained information about COVID-19 from their relatives and friends; this could be the limitation of social media sources and Internet services in conflict regions. Conversely, a study conducted in India reported that the primary sources of information about the disease were television and social media [26]. Our research found that the respondent's overall mean score of knowledge regarding COVID-19 was good with the rate was 73.8% (3.69/5*100), and they responded correctly about the type, origin, signs, and symptoms of the infection, complications, and ways to reduce the spread of the virus. This high knowledge among the internally displaced populations may be from their relatives and friends. However, a study conducted among IDPs in Somalia found that most participants did not know about basic coronavirus prevention measures [27]. The researchers tested the correlation

between the study variable of KPs; the Spearman's rho test demonstrated a significant positive, strong correlation between knowledge and practice regarding COVID-19 prevention. This result explains that participants with high knowledge regarding COVID-19 disease can adopt reasonable and positive practical measures toward preventing COVID-19. In contrast, a previously community-based study in Addis Ababa, Ethiopia revealed a weak correlation between knowledge and practice, but only a moderate positive correlation between respondents' knowledge and attitude [28].

We tested the hypothesis to compare overall mean scores of knowledge and practice variables with demographic characteristics to determine the differences. We found that the participants aged <20 years revealed significantly higher knowledge than other age groups. The graduates showed a statistically significantly higher average score of knowledge than other educational levels. However, uneducated people exhibited significantly less knowledge and practice. There is no formal education program campaign to increase their awareness and adherence to practical measures against COVID-19. Besides, there is limited access to online social-medical services in rural areas like the Darfur region. The studies are in line with those conducted in Pakistan and India that reported that older people had poor knowledge compared to students and graduates [22, 23]. However, a study conducted in Malaysia reported that knowledge scores were higher among females, higher income group, and those aged >50 [29]. Thus, we suggest focusing on continuous educational intervention and awareness programs for illiterates, less educated, and older people in future.

In the current study, the respondents' overall mean score was 2.65+1.08 with a rate of 53%, denoting moderate practice toward preventive measures against COVID-19. Respondents belonging to the younger ages and secondary education level showed significantly higher practice. However, those aged >60 years, uneducated respondents, and those who received their source of information from relatives and friends showed significantly low practice. There is no formal education program among older people to increase their adherence to practicing preventive measures against COVID-19.

In contrast, young people and graduates gained the information of COVID-19 from social media, Facebook, and WhatsApp. The result of our study is similar to a study conducted in Pakistan that reported that preventive practices toward COVID-19 were far from satisfactory. The study attributed poor behavior of practice because the study participants were older, formally uneducated, lived in the countryside, and had limited access to online health information resources [30]. Therefore, we suggest an urgent focus on the campaign to increase awareness of practical measures by demonstrating correct handwashing, wearing a mask, maintaining social distances, and avoiding

crowded areas. Since primary preventive measures from infection were frequently handwashing with soap and water for least 20 sec or using an alcohol-based handrub, staying at home, avoiding crowded places, avoiding touching eyes, nose, or mouth with unwashed hands, covering the mouth and the nose with a disposable tissue when coughing or sneezing or using elbow if no tissue is available. It is also essential to avoid close contact with anyone who has had a respiratory infection and maintaining at least a 1 m distance socially (11,12).

5. Conclusion

Most respondents had adequate knowledge and moderate practice toward COVID-19. Participants with a high level of education, namely secondary education and graduates, showed higher knowledge and practice toward COVID-19 than others. Our findings suggest an urgent need for educational intervention and awareness programs to focus on uneducated and older people.

Limitations

This current study has some limitations. First, the study was conducted among Sudanese IDP population in the central Darfur region, namely in Zalingei city. Second, we used a convenience sampling technique of a non-probability sampling method. We used both manual and online google forms for data collection through convenience sampling and snowball sampling. Thus, the results do not represent the entire IDP population of Sudan.

Implications

Our findings from this study may contribute to the existing literature. It may help the health policymakers plan awareness programs to raise consciousness and improve practical infection control measures against COVID-19 among the IDP population that may thereby reduce the spreading of the new coronavirus disease pandemic in the Darfur region.

Acknowledgements

The authors express gratitude to all participants who voluntarily agreed to take part in this study.

Ethical Considerations

The study was approved by the Faculty of Nursing Sciences' ethical committee, University of El Imam El Mahdi (Approval No/FNS/2020/02). Researchers explained the study's purpose to all study participants and achieved informed consent before proceeding with the questionnaire, and respondents were free to withdraw. All their responses were kept anonymous and strictly confidential and were used for research only; the results did not recognize the participants personally.

Competing Interests

The authors declare that there is no competing or conflict of interest.

Availability of Data and Material

All materials of this study are available from the corresponding author upon reasonable request.

Funding

Nil.

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