

Knowledge and Practice of COVID-19 Preventive Measures in an Internally Displaced Persons Camp, Zonkwa, Kaduna State, Nigeria - An Observational Study

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Abstract: The Coronavirus disease 2019 (COVID-19) was first reported in December 2019 in Wuhan China and declared a pandemic on 11 March 2020. The measures for prevention and control instituted and recommended by the World Health Organization (WHO) include hand hygiene, use of face masks and physical distancing. Physical distancing may be challenging in crowded places like internally displaced persons (IDPs) camps. Since the onset of the COVID-19 outbreak in Nigeria, information about the COVID-19 response in IDP settings is limited. The objectives of the study were to assess the knowledge of COVID-19 among the IDPs in Zonkwa camp, determine the practice of preventive measures and educate the IDPs on COVID-19 preventive measures. A cross-sectional study using interviewer administered questionnaires was conducted among IDPs in Zonkwa camp, Kaduna State. A multi-stage sampling method was used to select respondents. Information about socio-demographic data, awareness about COVID-19 was collected and assessment of knowledge of respondents about modes of transmission and prevention of COVID-19 was done using multiple response analysis. Data was analyzed using SPSS Version 26. Majority of the 276 respondents in this study were females, Christians and married. Television and radio were the major sources of health information about COVID-19, and awareness about the disease was high among majority of the respondents. The practice of preventive measures was poor, though better in males than females ($p=0.04$). A higher proportion of respondents with good knowledge of modes of transmission, and knowledge of symptoms were observed to have good practice of preventive measures, ($p<0.001$). The practice of infection preventive measures is very important in reducing the onset and spread of the COVID-19 infection. IDPs live in very peculiar conditions owing to their forced displacement. There was a significant

association between the overall level of knowledge of COVID-19 and the practice of preventive measures among respondents. Continuous health education about COVID-19 by the Kaduna State Ministry of Health to the IDPs will improve the practice of COVID-19 preventive measures.

Keywords: Coronavirus, Corona Virus Disease, Health Education, Infection Prevention and Control, Pandemic, Kaduna, Nigeria

1. Introduction

The Coronavirus disease 2019 (COVID-19) was first reported in China in December, 2019 [1], the World Health Organization (WHO) declared the COVID-19 outbreak a public health emergency of International Concern (PHEIC) on 30th January 2020, and declared a pandemic on 11th March 2020 [2].

As of February 14, 2022, the COVID-19 Visualizer powered by World-ometer had recorded more than 412 million confirmed cases and close to 6 million deaths globally. In Africa close to 8 million cases have been confirmed, including up to 7 million recoveries, and close to 170,000 deaths [3]. All 54 countries in Africa have reported cases of COVID-19 with 47 currently affected. The countries reporting the most cases are Egypt, Libya, Morocco, Tunisia and South Africa [3]. As of February 14, 2022, a total 254,016 cases had been confirmed, 230,397 cases have been discharged, and 3141 deaths have been recorded in Nigeria. Kaduna state so far has had 11,203 confirmed cases [4].

Coronavirus infection presents in most persons with mild to moderate respiratory illness and they recovered without requiring special treatment. However, older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer were more likely to develop serious illness [5].

Nigeria was one of the first countries in Africa to recognize the risk and started planning a COVID-19 outbreak response. A multi-sectoral National Coronavirus Preparedness Group was established by Nigeria Centre for Disease Control (NCDC) on January 7, 2020 in a massive effort of national coordination. This was one week after China first reported the cases and three weeks before WHO declared the disease to be of international concern [6]. This group also formed the leadership of the Presidential Task Force (PTF) on COVID-19, set up by the Government of Nigeria.

The measures for prevention, control and public health advisories recommended include:

1. Hand Hygiene: Washing hands regularly with soap under running water or with use of an alcohol-based sanitizer if water and soap are available.
2. Physical/Social distancing through use of no-touch greetings, maintaining at least 2 meters (6 feet) distance between yourself and anyone who is coughing or sneezing. Do not self-medicate, Avoiding/postponing events with large gatherings of people including schools, workplaces, places of worship, crowded supermarkets and pharmacies, social and sporting events.
3. Hand and respiratory hygiene: Covering one's nose with

tissue when sneezing or coughing, Immediate disposal of tissue in a covered bin and washing hands with soap and water, use of an alcohol-based sanitizer if no water and soap is available, Coughing or sneezing into the sleeve of your bent elbow if no tissue is available.

4. Avoiding all non-essential travel to all countries [7].

Social and physical distancing may be an enormous challenge in crowded places like internally displaced persons' camp, markets, places of religious gathering, among others. An internally displaced person (IDP) is a person forced to flee his or her home but who remains within his or her country's borders. They are often referred to as refugees, although they do not fall within the legal definitions of a refugee [8]. One of the notable IDP camps in Kaduna Nigeria is in Zonkwa, Zangon Kataf Local Government Area of the state.

COVID-19 has been established to be a very infectious disease, with the number of reported cases reaching over 157 million cases in +over 200 countries and territories within a one-year period with cases still rising [9]. Recent studies have shown that the Coronavirus can be found in stools and fecal matter. Evidence also shows that Internally Displaced Persons (IDPs) are more at risk of water shortage and water borne infections, have reduced access to Water, Sanitation and Hygiene, due to the challenges of their forced displacement [10]. Consequently, institution of preventive strategies for COVID-19 infection may come as a challenge for internally displaced persons. It is believed that educating IDPs about these preventive strategies will contribute to containing the pandemic before it reaches the IDP camps, where disease morbidity and mortality could potentiate a worse humanitarian crisis.

The risk of contracting COVID-19 is higher in IDP camps as IDPs are more susceptible to complications, owing to cramped living conditions, location in urban slums; poor nutritional and health status; limited access to water, sanitation, health care and reliable information; lack of support networks; language barriers and other social and cultural obstacles [11]. The peculiarity of the northern culture encourages communal sharing, communal living and close-knit contacts. However, the highly infectious nature of the COVID-19, the understanding of asymptomatic transmission and the efficiency of preventive measures have made having the knowledge of these strategies important to IDPs who may not have had access to appropriate information.

These highlighted factors make assessing the effect of educational intervention amongst the IDPs important. The aim of this study was to determine the knowledge and practice of COVID-19 preventive measures IDPs in Zonkwa camp with a view to making policy recommendations. The objectives of

the study were: to assess the knowledge of COVID-19 among the IDPs in Zonkwa camp as well as to determine the practice of preventive measures against COVID-19 among IDPs in Zonkwa camp.

2. Methods

The research was a cross-sectional study among IDPs in Zonkwa camp, Kaduna State. A multi-stage sampling technique was used to select respondents: Information was collected via interviewer administered questionnaires. Data was analyzed using SPSS Version 26. Descriptive statistics were expressed as means and proportions. Bivariate and Multivariate analysis were done to identify factors associated with the knowledge and practice of COVID-19 preventive measures.

2.1. Data Analysis Plan

The categorical variables such as awareness of COVID-19 and socio-demographic variables were summarized using frequencies and proportions. Multiple response analysis was used to analyze variables like the source of information, knowledge of symptoms of COVID-19, knowledge of COVID-19 and knowledge of preventive measures of the disease.

The knowledge of COVID-19 was assessed based on response to ten sets of questions. A positive response to each question attracts one mark while a negative response attracts a zero mark. Respondents that scored at least an average of the maximum attainable score were considered to have good knowledge of COVID-19 disease.

The practice of COVID-19 preventive measures was assessed based on response to ten questions. A positive response to each question attracts one mark while a negative response attracts a zero mark. Respondents that scored at least an average of the maximum attainable score were considered to have a good practice of COVID-19 preventive measures.

Association between respondents' characteristics, sociodemographic variables, awareness and knowledge of the disease (symptoms and modes of transmission) and practice of preventive measures were assessed using Chi-Square tests. Determinants of the practice of COVID-19 preventive measures were assessed using binary logistic regression and a p-value of <0.05 was set to be statistically significant.

2.2. Study Area

Kaduna state is in the North West zone of Nigeria. The city is industrial, commercial and cosmopolitan with projected population 8,908,956 persons from the Kaduna State Bureau of statistics as at the end of 2019. The residents are a mixed population of farmers, traders, students, civil servants, retired and serving military personnel. Zangon Kataf is one of the 23 Local Governments Areas (LGAs) in Kaduna State, Nigeria and the Headquarters is in Zonkwa [12].

This study was conducted in Zonkwa IDPs camp, Zangon

Kataf LGA Kaduna, Nigeria. The persons in the camp are sheltered in the primary and secondary schools of the Evangelical Christian Ministry of West Africa. They have two functional boreholes and have a clinic run by retired Nurses and volunteers. Different teams of volunteer health workers visit from time to time. Churches and Non-governmental organizations also donate food items to them.

2.3. Study Population

Inclusion Criteria: Consenting IDPs 18 years old and above were selected to be respondents for this study.

Exclusion Criteria: Non-consenting participants, those less than 18 years (as assessing practice of prevention and control measures against COVID-19 may be difficult to determine in this age group), mentally challenged or very sick participants were excluded as information obtained from this category of participants may not be very reliable.

Ethical approval and clearance certificate to conduct the study, were obtained from the Ethics and Research Committee of Kaduna State Ministry of Health, Kaduna, Nigeria with ethical approval number NHREC/03/17/2018. Informed written consent was obtained from all the participants that were recruited for this study

Table 1. Sociodemographic Characteristics of IDPs of Zonkwa Camp, Kaduna State.

Variables	n (%), n=276
Gender	
Male	70 (25.4)
Female	206 (74.6)
Level of Education	
No formal education	41 (14.9)
Primary	77 (27.9)
Secondary	97 (35.1)
Tertiary	61 (22.1)
Religion	
Christianity	273 (98.9)
Islam	2 (0.7)
Traditional Religion	1 (0.4)
Marital Status	
Married	213 (77.2)
Single	32 (11.6)
Divorced	2 (0.8)
Widowed	29 (10.5)

Table 2. Sources of Information about COVID-19 from IDPs in Zonkwa Camp, Kaduna State.

Source	n (%)
Television	222 (23.4)
Radio	223 (23.5)
Newspaper	122 (12.9)
Social Media	123 (13.0)
Handbills/Leaflet	89 (9.4)
Neighbours	170 (17.9)

*Multiple response analysis.

3. Results

A total of 276 respondents participated in the study with a median age of 40.0 (IQR=21.8) years. Majority of the

respondents were females, (74.6%), Christians (98.9%), and married (77.2%) (Table 1). Television (222 (23.4%) and radio 223 (23.5%) were the major sources of health information about COVID-19 while handbills/leaflets 89 (9.4%) were the least mentioned (Table 2). Awareness about COVID-19 was high among majority of the respondents, 265 (96.0%) (Figure 1). Majority of the respondents were aware of at least one symptom of COVID-19 disease. Dry cough was the most mentioned symptom of COVID-19, by 189 (80.4%) respondents, followed by fever, which accounted for 165 (70.2%). “Sneezing” 138 (58.7%) though incorrect and difficulty with breathing 126 (53.6%) were the next among the most common mentioned symptoms of COVID-19 (Table 3).

Table 3. Knowledge of COVID-19 symptoms by IDPs of Zonkwa Camp, Kaduna State.

Symptoms of COVID-19 Diseases	n (%)
Dry cough	189 (14.1)
Fever	165 (12.4)
Sneezing	138 (10.3)
Tiredness	92 (6.9)
Difficulty breathing	126 (9.4)
Abdominal pain	56 (4.2)
Stooling	47 (3.5)
Vomiting	57 (44.3)
Thirsty all the time	50 (3.7)
Bleeding	45 (3.4)
Sore throat/difficulty in swallowing	85 (6.4)
Sweating excessively	44 (3.3)
Symptom Body ache	52 (3.9)
Symptom weakness	87 (6.5)
Symptom headache	103 (7.7)

*Multiple Response Analysis.

The most mentioned method of preventing the spread of

COVID-19 was handwashing, 223 (15.8%) followed by avoidance of handshaking, 144 (10.2%), practice of social distancing, 165 (11.7%) as well as physical distancing 138 (9.8%). Misconceptions like drinking hot water and salt and steam inhalation were mentioned by 28 (2.0%) of the respondents. A total 61 (4.3%) believed that only God’s intervention can help in curbing the spread of the disease, while 19 (1.3%) respondents believed that transmission of COVID-19 cannot be prevented (Table 4). The Practice of COVID-19 preventive measures was poor among most 181 (65.6%) of the respondents (Figure 2). A total 225 (81.5) cough into the air, 180 respondents (65.2%) cough or sneeze into their hands and majority 171 (62.0%) do not cough into disposable tissue.

Table 4. Knowledge of Preventive Measures by IDPs of Zonkwa Camp, Kaduna State.

Preventive Measures	n (%)
Handwashing	223 (15.8)
Social distancing	165 (11.7)
Physical distancing	138 (9.8)
Respiratory hygiene	103 (7.3)
Avoidance of touching nose, mouth, and face	145 (10.3)
No handshaking	144 (10.2)
Use of face mask	177 (12.5)
Consumption of bitter cola	37 (2.6)
Avoid contact with sick people	95 (6.7)
Ensure regular prayer and spiritual fortification	48 (3.4)
Drinking hot water and salt	28 (2.0)
Steam inhalation	28 (2.0)
It cannot be prevented	19 (1.3)
Only God intervention can help	61 (4.3)

*Multiple Response Analysis.

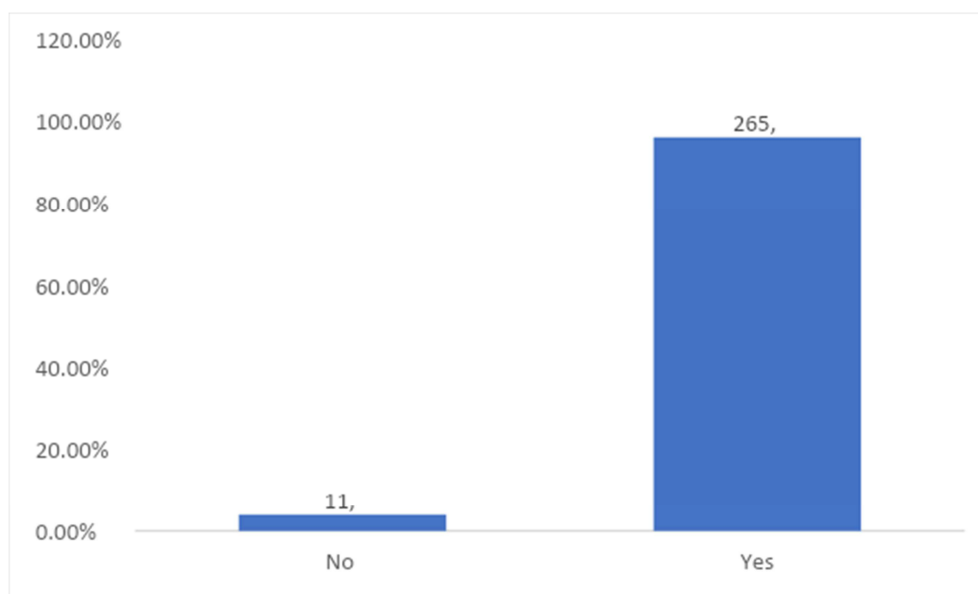


Figure 1. Awareness about COVID-19 Disease among IDPs in Zonkwa Camp, Kaduna State.

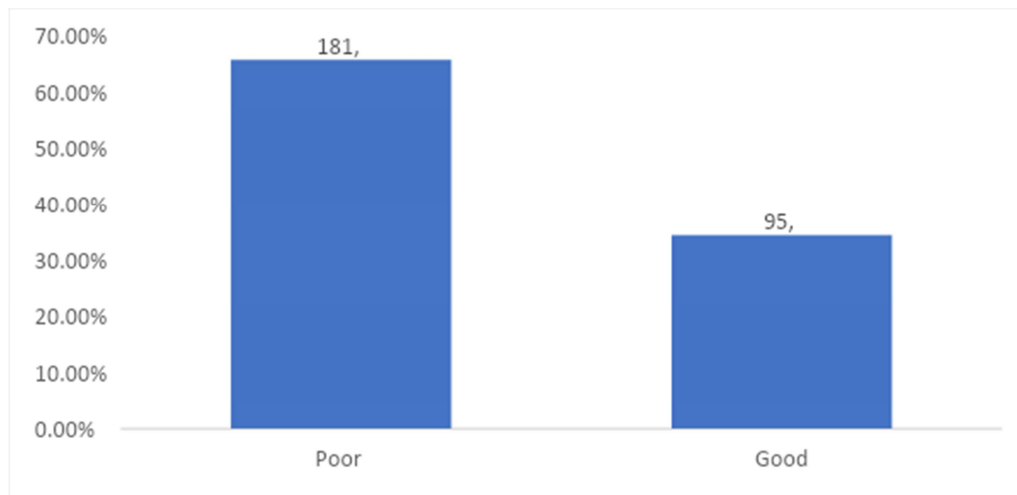


Figure 2. Practice of COVID-19 Preventive Measures by IDPs of Zonkwa Camp, Kaduna State.

Data analysis showed that preventive measures had significant association with sex of the respondents. A higher proportion of males 31 (44.3%) had good practice of preventive measures relative to the proportions among females, 64 (31.1%), ($p=0.044$). Level of education had a significant association with the practice of COVID-19 preventive measures as the proportions of respondents with

good practice of COVID-19 preventive measures were observed to increase significantly from primary level of education to tertiary level of education, ($p=0.008$). There was also a significant association between awareness of COVID-19, overall knowledge of COVID-19 and the practice of preventive measures to prevent the incidence or spread of the disease, ($p=0.018$). (Table 5).

Table 5. Association between Respondents Characteristics and Practice of COVID-19 Preventive Measures.

Variables	Practice of Preventive Measures		Statistics
	Poor n (%)	Good n (%)	
Sex			
Male	39 (55.7)	31 (44.3)	$X^2=4.04$ $P=0.04$
Female	142 (68.9)	64 (31.1)	
Occupation			
Schooling	22 (66.7)	11 (33.3)	$X^2=1.15$ $P=0.56$
Employed	27 (58.7)	19 (41.3)	
Unemployed	124 (67.0)	61 (33.0)	
Level of Education			
No formal Education	29 (70.7)	12 (29.3)	$X^2=11.88$ $P=0.008$
Primary	60 (77.9)	17 (22.1)	
Secondary	61 (62.9)	36 (37.1)	
Tertiary	31 (50.8)	30 (49.2)	
Religion			
Islam	1 (50.0)	1 (50.0)	$X^2=2.14$ $P=0.344$
Christianity	180 (65.9)	93 (34.1)	
Traditionalist	0 (0.0)	1 (100.0)	
Awareness of COVID-19			
No	11 (100.0)	0 (0.0)	Fisher's=6.01 $P=0.018$
Yes	170 (64.2)	95 (35.8)	
Knowledge of mode of transmission			
Poor	123 (83.1)	25 (16.9)	$X^2=43.44$ $P<0.001$
Good	58 (45.3)	70 (54.7)	
Knowledge of Symptoms			
Poor	146 (76.4)	45 (23.6)	$X^2=32.41$ $P<0.001$
Good	35 (41.2)	50 (58.8)	
Knowledge of preventive measures			
Poor	22 (75.9)	7 (24.1)	$X^2=1.52$ $P=0.218$
Good	159 (64.4)	88 (35.6)	
Overall level of knowledge of COVID-19			
Poor	125 (81.2)	29 (18.8)	$X^2=37.5$ $P<0.001$
Good	56 (45.9)	66 (54.1)	
Age			
Median (IQR)	40.0 (22.0)	40.0 (19.5)	U=7096.0 $P=0.498$

All the 11 (100.0%) respondents that were not aware of COVID-19 disease had poor practice of preventive measures, while 95 (35.8%) of respondents who were aware of the disease practiced preventive measures against the spread. Higher proportion of respondents with good knowledge of modes of transmission, 70 (54.7%) and knowledge of symptoms, 50 (58.8%) were observed to have good practice of COVID-19 preventive measures, ($p < 0.001$).

Binary logistic regression of the association between respondents' characteristics and practice of preventive measures showed that respondents with good knowledge of

modes of transmission of COVID-19 had four times the odds of practicing preventive measure relative to respondents with poor level of knowledge, (odds ratio=4.0, $p < 0.001$, CI=2.04 – 7.79). Also, respondents who are males and those with good knowledge of COVID-19 symptoms had almost twice the odds (1.9 times) of practicing COVID-19 preventive measures better than respondents with poor knowledge of the disease's symptoms. This was however not statistically significant, ($p = 0.059$, $p = 0.25$). Knowledge of modes of transmission was found to be an independent predictor of prevention practices among respondents (Table 6).

Table 6. Binary Logistic Regression of Association Between Respondents Characteristics and Practice of COVID-19 Preventive Measures.

Variables	Odds Ratio	p- value	95% CI
Gender			
Female	Ref	0.249	
Male	1.5		0.770 – 2.733
Level of Education			
No formal education	Ref	0.223	0.216 – 1.429
Primary	0.555	0.810	0.377 – 2.143
Secondary	0.899	0.601	0.503 – 3.280
Tertiary	1.285		
Knowledge of COVID-19 means of transmission.			
Poor	Ref		
Good	4.0	< 0.001	2.037 – 7.799
Knowledge of COVID-19 symptoms			
Poor	Ref		
Good	1.9	0.059	0.975 – 3.805



Figure 3. Members of the Outreach team and the Zonkwa IDP Camp Officials.



Figure 4. Health Education as part of Public Health Interventions to the IDPs.



Figure 5. Donation of IEC and IPC Materials to the IDPs by the Outreach Team of the Research Group.

The practice of COVID-19 preventive measures was poor among most respondents. A higher proportion of males had good practice of preventive measures relative to females. Increasing level of education were observed to significantly increase good practice of COVID-19 preventive measures. There was a significant association between awareness of COVID-19 and the practice of preventive measures to address the spread of the disease.

The overall level of knowledge of COVID-19, (assessed through the summation of scores from the knowledge of mode of transmission, symptoms, and preventive measures) had a significant association with the practice of preventive measures among respondents, ($p < 0.001$). Occupation, age, and knowledge of preventive measures against COVID-19 were not significantly associated with the practice of COVID-19 preventive measures.

4. Discussion

Clear, Correct and Complete Information is fundamental in the practice of preventive measures against infectious diseases including COVID-19. This study found that most of the respondents were informed through television and radio about the disease. Olufemi et al and Dkhar et al in their studies noted that most persons got their information about COVID-19 online, through the internet [12, 13], these studies were however online surveys, and may be the reason for eliciting this response. Evidence shows that the more important thing is for people to have accurate and timely information irrespective of the source,

as verified information dissemination is a very vital diseases' prevention strategy [14, 15].

The practice of COVID-19 preventive measures is critical to breaking the chain of transmission. The findings in this study however showed that the respondents' practice of these preventive measures was poor, and comparable to the findings of Shurkuk et al, which showed poor risk reduction practices amongst participants in a community based cross-sectional study, conducted among the general population in Kaduna State [16]. The poor infection prevention and control practice of in this study may be related to the nature of IDP camps as noted by Claude et al; expressing that the crowded nature of IDP camps make practice of infection prevention and control measures difficult [17]. Similarly, Rozenfeld et al elaborated that COVID-19 infection transmission is more likely in persons with food insecurity, homelessness, environmental insecurity and victims of armed conflict or forced displacement [18]; this is typical of those in IDP camps as they live in very poor, deprived and crowded settings, consequently measures like social or physical distancing may be practically difficult to observe.

Our study showed that a higher proportion of males had good practice of preventive measures relative to females, likewise, Ngwewondo et al in Cameroon found that women had lower COVID-19 preventive measures scores compared to men [19]. This finding was however at variance with the findings of Al-Hanawi et al, which showed that men have less knowledge, less optimistic attitudes, and poorer practice towards COVID-19 prevention practices, compared to women [21]. The discrepancy in findings may be related to socio-cultural differences and health belief systems of the populations studied.

Increasing level of education was observed to significantly increase good practice of COVID-19 preventive measures, this is corresponding to findings of Nwonwu et al [20] in Enugu Nigeria, which revealed that increased level of education is a good predictor of the practice of infection preventive measures.

This study found that there is a significant association between knowledge of COVID-19 and the practice of preventive measures to address the spread of the disease. COVID-19 is a relatively new disease, hence not many people may have good overall knowledge (in terms of signs, symptoms, and routes of transmission) of the disease especially among lay persons. This is in line with the finding of Alahdal et al in Riyadh Saudi Arabia, who conducted an analytical study which showed that public awareness improves attitude and preventive practice to infections [22]. Similarly, Iyal et al in a study among Health Care Workers (HCW) in Kaduna State Nigeria found a positive correlation between knowledge of HCWs on COVID-19 infection and infection prevention and control practices [23]. Awareness, education and knowledge therefore drives better infection prevention practices.

Deriving from the above discussion, practice of preventive measures is very important in reducing spread of the COVID-19 infection. However, the nature of IDP Camps may

constrain practice of preventive measures difficult though this was not the findings of this study. Public awareness of the infection and the preventive measures have been seen to be positively related to practice of the measures. The limitation of this study was that being a cross sectional study, it could not test causality.

5. Conclusion

It is known that IDPs live in very peculiar and deprived conditions, therefore outbreak response should be considered and prioritized for populations in these settings as part of pandemic planning and prevention, to interrupt a potential worse humanitarian crisis. Though most of the respondents were informed and aware about COVID-19 and had knowledge about the disease, their practice of preventive measures was poor.

Awareness, Knowledge about COVID-19, gender, increasing level of education were also observed to significantly increase good practice of COVID-19 preventive measures to address the spread of the disease. Knowledge of modes of transmission was found to be an independent predictor of prevention practices among respondents. There was a need to continue to improve the knowledge of COVID-19 infection and educate the IDPs preventive measures to prevent onset and possible transmission, especially through radio and other accessible information channels.

Based on the findings of this study, the outreach team of this research group, developed Information, Education and Communication materials and distributed them to the IDPs and carried out health education activities in the IDP camp to improve awareness and knowledge of COVID-19. A free medical outreach was conducted as part of the humanitarian service to the IDPs, surgical face masks and hand sanitizers were distributed, and the research team set up handwashing stations, as part of as part of public health interventions to improve practice of infection control measures.

Continuous and consistent health education to other IDP camps by Kaduna State Ministry of Health is recommended.

6. What Is Known About This Topic

- 1) Studies have shown that IDPs live in crowded environments with minimal access to water, sanitation and hygiene and therefore are more prone to infectious diseases.
- 2) Other studies have revealed poor practice of COVID-19 preventive measures especially among less educated people.

7. What This Study Adds

- 1) There is paucity of data and limited information about the outbreak and pandemic response among IDPs in Nigeria.
- 2) This study provides current evidence about knowledge of IDPs about COVID-19 prevention practices.

Consent for Publication

All authors fully participated in the development of the manuscript and gave permission for submission of this version of the manuscript.

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Competing Interests

The Authors declare that there are no competing interests.

Authors Contributions

PAO and OTO conceptualized the study structure and format. JIA AAO, ZKM and OTO worked serially on different sections of the draft manuscripts. PEI, MY, AZ, MNO, SJ, TAO edited, proof-read and modified the questionnaire and different versions of the manuscript. JIA and OTO edited and reviewed the manuscript for intellectual content, PAO and OTO summarized the data analysis and interpretation. All authors have read and agreed to the final manuscript.

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References

- [1] Habas K, Nganwuchu C, Shahzad F, Gopalan R, H aque M, Rahman S, Majumder AA, Nasim T. Resolution of coronavirus disease 2019 (COVID-19). *Expert Rev Anti Infect Ther.* 2020; (12): 1201-1211. <https://www.tandfonline.com/doi/full/10.1080/14787210.2020.1797487>.
- [2] Chih-Cheng Lai, Tzu-Ping Shih, Wen-Chien Ko, Hung-Jen Tang. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and Coronavirus disease-2019 (COVID-19): The Epidemic and the Challenges. *Int J Antimicrob Agents.* 2020; 55 (3). <https://pubmed.ncbi.nlm.nih.gov/32081636/>.
- [3] <https://www.afro.who.int/health-topics/coronavirus-COVID-19>. <https://www.COVIDvisualizer.com/> Accessed 14 February 2022.
- [4] Nigeria Centre for Disease Control. Coronavirus (COVID 19) highlights. <https://COVID19.ncdc.gov.ng/#>. Accessed 12 February 2022. <https://COVID19.ncdc.gov.ng/>.
- [5] World Health Organization. Coronavirus. <https://COVID19.who.int/> Accessed 18 April 2021.
- [6] Kapata N, Ihekweazu C, Ntoumi F, Raji T, Chanda-Kapata P, Mwaba P, Mukonka V, Bates M, Tembo J, Corman V, Mfinanga S, Asogun D, Elton L, Arruda LB, Thomason MJ, Mboera L, Yavlinsky A, Haider N, Simons D, Hollmann L, Lule SA, Veas F, Abdel Hamid MM, Dar O, Edwards S, Vairo F, McHugh TD, Drosten C, Kock R, Ippolito G, Zumla A. Is Africa prepared for tackling the COVID-19 (SARS-CoV-2) epidemic. Lessons from past outbreaks, ongoing pan-African public health efforts, and implications for the future. *Int J Infect Dis.* 2020; (93): 233-236. <https://pubmed.ncbi.nlm.nih.gov/32119980/>.
- [7] Nigeria Centre for Disease Control. Ten New Cases of COVID-19 confirmed in Nigeria. <https://ncdc.gov.ng/news/237/update-on-COVID-19-in-nigeria>. Dated March 21, 2020.
- [8] UNHCR. IDP Definition. Overview. <https://emergency.unhcr.org/entry/44826/idp-definition>. Accessed 7 May 21.
- [9] European Centre for Disease Prevention and Control. Rapid Risk Assessment: Coronavirus Disease 2019 (COVID 19) in the EU/EEA and the UK- Ninth Update. <https://www.ecdc.europa.eu/en/publications-data/rapid-risk-assessment-coronavirus-disease-2019-COVID-19-pandemic-ninth-update>. Accessed 23 April 2020.
- [10] Istifanus A Joshua, Benjamin David Biji, Abdulrazak Abdullahi Gobir, Alhaji A Aliyu, Audu Onyemochi, Awawu Grace Nmadu, Jerry Godfrey Makama, Mathew Bobai, Abimbola G Olayemi, Kashini Andrew. Social characteristics and risk factors for diseases among internally displaced persons: A study of stefano's foundation camp in Jos, Nigeria. *Archives of medicine and surgery.* 2016; 1 (2): 42-49. https://www.researchgate.net/publication/321560692_Social_Characteristics_and_Risk_Factors_for_Diseases_among_Internally_Displaced_Persons_A_Study_of_Stefano's_Foundation_Camp_in_Jos_Nigeria.
- [11] International Committee of the Red Cross (ICRC). Reducing the impact of COVID 19 pandemic in internally displaced persons. <https://media.ifrc.org/ifrc/wp-content/uploads/2020/05/Reducing-the-impact-of-the-COVID-19-pandemic-on-internally-displaced-people-IDPsPDF2.pdf> Updated May 2020. Accessed 15 August 2020.
- [12] Erinoso O, Wright KO, Anya S, Kuyinu Y, Abdur-Razzaq H, Adewuya A. Predictors of COVID-19 Information Sources and Their Perceived Accuracy in Nigeria: Online Cross-sectional Study. *JMIR Public Health Surveill.* 2021; 7 (1): e22273. <https://publichealth.jmir.org/2021/1/e22273/>
- [13] Dkhar SA, Quansar R, Saleem SM, Khan SMS. Knowledge, attitude, and practices related to COVID-19 pandemic among social media users in J&K, India. *Indian J Public Health.* 2020; 64 (Supplement): S205-S210. <https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/en/COVIDwho-565102>.

- [14] Teslya A, Pham TM, Godijk NG, Kretzschmar ME, Bootsma MCJ, Rozhnova G. Impact of self-imposed prevention measures and short-term government-imposed social distancing on mitigating and delaying a COVID-19 epidemic: A modelling study. *PLoS Med.* 2020; 17 (7): e1003166. <https://doi.org/10.1371/journal.pmed.1003166>.
- [15] Cuan-Baltazar JY, Muñoz-Perez MJ, Robledo-Vega C, Pérez-Zepeda MF, Soto-Vega E. Misinformation of COVID-19 on the Internet: Infodemiology Study. *JMIR Public Health Surveill.* 2020; 6 (2): e18444. <https://publichealth.jmir.org/2020/2/e18444/>.
- [16] Shurkuk C, Akunne J, Joseph S, Olasinde T, Kase S, Dahiru T, Emmanuel G, Bakut I, Babale S. COVID-19 Risk Perception and Risk Reduction Practices among the Population of Kaduna State. *J Med B Sci Res* [Internet]. 2021 Jan. 17 [cited 2021 May 9]; 1 (1): 49-57. Available from: <https://jmbsr.com.ng/index.php/jmbsr/article/view/7>.
- [17] Claude KM, Serge MS, Alexis KK, Hawkes MT. Prevention of COVID-19 in Internally Displaced Persons Camps in War-Torn North Kivu, Democratic Republic of the Congo: A Mixed-Methods Study. *Glob Health Sci Pract.* 2020; 8 (4): 638-653. <https://www.ghspjournal.org/content/8/4/638>, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7784064/>.
- [18] Rozenfeld Y, Beam J, Maier H, Haggerson W, Boudreau K, Carlson J, Meadows R. A model of disparities: risk factors associated with COVID-19 infection. *Int J Equity Health.* 2020; 19 (1): 126 PMID: 32727486 | PMCID: PMC7387879. (PDF) A model of disparities: Risk factors associated with COVID-19 infection (researchgate.net) <https://pubmed.ncbi.nlm.nih.gov/32727486/>.
- [19] Ngwewondo A, Nkengazong L, Ambe LA, Ebogo JT, Mba FM, Goni HO, et al. (2020) Knowledge, attitudes, practices of/towards COVID 19 preventive measures and symptoms: A cross-sectional study during the exponential rise of the outbreak in Cameroon. *PLoS Negl Trop Dis* 14 (9): e0008700. <https://doi.org/10.1371/journal.pntd.0008700>.
- [20] Al-Hanawi MK, Angawi K, Alshareef N, Qattan AMN, Helmy HZ, Abudawood Y, Alqurashi M, Kattan WM, Kadasah NA, Chirwa GC, Alsharqi O. Knowledge, Attitude and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. *Front Public Health.* 2020; 8: 217. <https://www.frontiersin.org/articles/10.3389/fpubh.2020.00217/full>.
- [21] Nwonwu EU, Ossai EN, Umeokonkwo CD, Ituma IB. Knowledge and preventive practice to COVID-19 among household heads in Enugu metropolis, South-East Nigeria. *Pan Afr Med J.* 2020; 37: 63. <https://europepmc.org/article/MED/33244326>.
- [22] Alahdal H, Basingab F, Alotaibi R. An analytical study on the awareness, attitude, and practice during the COVID-19 pandemic in Riyadh, Saudi Arabia. *J Infect Public Health.* 2020; 13 (10): 1446-1452. <https://www.sciencedirect.com/science/article/pii/S1876034120305256>.
- [23] Iyal H, Ishaku S, Zakari A, Ibrahim S, Olasinde T, Sunday J, Ejembi C, Madubu D, Idris Z, Umeh G, Shurkuk C, Yahaya A, Umar A, Akunne J, Shuaibu M, Manga H, Ahmed L, Samaila L, Mbais E, Usman S, Ijei I, Bakut I, Medickor V, Garry E, Kase S, Shuaibu I. Knowledge and Practice of Kaduna State Health Care Providers on Infection Prevention and Control during COVID-19 Pandemic. *J Med B Sci Res* [Internet]. 2021; 1 (1): 27-41. <https://www.jmbsr.com.ng/index.php/jmbsr/article/view/5/>.