



Are Health Workers in Nigeria Prepared for the COVID-19 Pandemic? A Case Study of Selected Health Workers in Plateau State, Nigeria

Chundung Asabe Miner^{a*}, Simji Samuel Gomerep^b, Daniel Jatau Meshak^c,
Solomon Chuwang Chollom^d, Kim Jerry Bot^e, Mark Ojogba Okolo^f, Ezra
Samuel Dablet^g, Louis Onyechi Nwokolo^h, Bulus Jonathanⁱ, Ponfa Pyentim^j,
Mercy Lenka^k, Andrawus Zuhumnan Ndak^l, Mathew Adeniyi Adewale^m, Naya
Gadzama Bulusⁿ

^a*Department of Community Medicine, University of Jos, Nigeria*

^b*Department of Internal Medicine, Infectious Disease Unit, University of Jos, Nigeria*

^c*Department of Family Medicine, University of Jos, Nigeria*

^d*Virology Research Department, National Veterinary Research Institute, Vom, Nigeria*

^e*Family Health International (Fhi360), Yobe State, Nigeria*

^f*Department of Medical Microbiology, University of Jos, Nigeria*

^g*General Hospital Mangu, Plateau State Hospitals Management Board, Nigeria*

^h*University of Jos Health Services, Jos, Nigeria*

ⁱ*Department of Medicine, Plateau State Specialist Hospital, Nigeria,* ^j*Pharmacy Department, Jos University Teaching Hospital, Nigeria,* ^k*Department of Nursing Services, Jos University Teaching Hospital, Nigeria*

^l*Nursing Unit, Comprehensive Health Centre Dadin Kowa, Plateau State Hospitals Management Board, Nigeria,* ^m*AIDS Prevention in Nigeria (APIN) Centre, Jos University Teaching Hospital, Nigeria*

ⁿ*Department of Community Medicine, Jos University Teaching Hospital, Nigeria*

^a*Email: chundungminer@yahoo.com,* ^b*Email: simjoma04@gmail.com,* ^c*Email: danmeshak@gmail.com,* ^d*Email: chollom4real@yahoo.com,* ^e*Email: botkim3@gmail.com,* ^f*Email: okolomark@gmail.com,* ^g*Email: ezra.dablets@yahoo.com,* ^h*Email: louienwokolo@yahoo.com,* ⁱ*Email: jonathanb1@yahoo.com,* ^j*Email: ppyentim@gmail.com,* ^k*Email: mercyniclenka@gmail.com,* ^l*Email: ndakkizito2@gmail.com,* ^m*Email: adewale.mathew@gmail.com,* ⁿ*Email: bulusnaya@gmail.com*

* Corresponding author.

Abstract

Background: COVID-19 is a disease that has resulted in a worldwide pandemic. Health workers have been identified to be at a higher risk compared to the general population due to increased exposure primarily at the work place and having to deal with a novel disease whose epidemiology is still evolving. As health workers are vital to control efforts, their response will be influenced by what they know, their perception of the disease and their practices. This study therefore sought to assess the knowledge, perceptions and practices of health workers on COVID-19 in Plateau State, Nigeria.

Method: It is a descriptive study that used a self-administered questionnaire to collect data on 105 health workers of Plateau State who were purposively selected. Data was collected on their knowledge, perceptions and practice of COVID-19 and analyzed using SPSS version 23 at a confidence interval of 95%.

Results: Mean age of health workers was 42.5 ± 9.2 years. Females made up 58% of the respondents, males were 42%. Nurses made up 69% of the respondents. More than 70% had worked for 10 – 29 years. Knowledge of COVID-19 was found to be inadequate in 57% of the health workers with social media being most frequent (69.5%) source of information. Most (86.6%) respondents had a good perception towards COVID-19 and 62.8% were willing to attend to a COVID-19 patient. There were consistent practices of hand hygiene and cough etiquette. Sixty percent had access to at least one form of personal protective equipment though 72.4% had never had training on putting on the full personal protective gear required for COVID-19.

Conclusion: There is an urgent need for training of health care workers in Plateau State and provision of full personal protective gear to ensure their safety at work.

Key words: COVID-19; health workers; knowledge; perception; practice.

1. Introduction

Coronavirus disease (COVID-19) is a highly infectious and pathogenic viral disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Late 2019 saw its emergence in Wuhan, China and its subsequent spread around the world [1,2]. The highest number of cases as well as fatality are currently reported to be in the United States of America (USA) [3]. Africa recorded its first case in Egypt on 14th February, 2020 and has spread now to affect all countries in the continent. The index case in Nigeria was reported on 27th February, 2020 and has spread to affect its 36 states including the Federal Capital Territory (FCT) with over 42,208 cases recorded as at 29th July, 2020 [4,5]. SARS-CoV-2 belongs to the Betacoronavirus genus in the Coronaviridae family and was thought to have been transmitted from animal to man but now man-to-man transmission has been established [6,7]. Transmission of the virus occurs by direct contact with infected persons or indirect contact with contaminated surfaces in the immediate environment or with objects used on the infected person [8]. Hence the spread is primarily said to be limited to family members, healthcare professionals and other close contacts [9]. Infected persons may present asymptomatic or develop fever, cough, fatigue, anorexia, shortness of breath, sputum production and myalgia. Other presentations include headache, confusion, rhinorrhea, anosmia and ageusia [10]. Management of cases is basically symptomatic as there is no approved

drug for the disease and prevention entails isolation, quarantine, physical distancing and hygiene, all of which require responsibility from healthcare providers and patients as well [11]. Adherence to control measures is very important in winning the fight against the infection and people's adherence to these measures is said to be influenced by people's knowledge, attitude and practice towards COVID-19 [12,13]. Healthcare workers, being vital in the control of the infection, need to be protected from the infection and their knowledge as well as attitude and practice towards the disease is important in ensuring that. Though several other factors such as overcrowding, absence of isolation facilities and environmental contamination have been identified to facilitate transmission of the disease to healthcare workers, poor knowledge as well as attitude and practice may further compound the problem [14]. Due to obscurity of the novel virus, occasioned by the misinformation and disinformation shared on social media [15,16], a sound knowledge of the disease is needed by healthcare workers who should serve as channels of accurate information about the disease to the general public. Assessment of healthcare workers' knowledge, attitude and practice towards COVID-19 would provide baseline information to determine the type of intervention needed to address misconceptions and gaps identified. It would also inform trainings and policies during the pandemic as well as guide healthcare workers in protecting themselves and avoiding occupational exposure. This study therefore aims to assess healthcare workers' knowledge, perception and practice towards coronavirus disease in Plateau State and to assess the factors that may influence them.

2. Materials and Methods

This was a cross-sectional study carried out in April and May of 2020 among health workers working in health facilities in Plateau State. Plateau State is one of the 36 States that make up Nigeria, located in the North Central region of the country and covering an area of 26,899 km²[16]. The State is divided into three senatorial zones (north, central and south) made up of seventeen Local Government Areas (LGAs). It has 1470 health facilities manned by over 5500 health workers [18]. Training workshops were organized by the State Ministry of Health on infection, prevention and control (IPC) of COVID-19 across the three senatorial zones. Health workers were nominated and invited to attend from the three zones. Respondents were purposively selected as they came for the training. Inclusion criteria for the study were that they were frontline health workers who performed primarily clinical duties at their facilities. Non-professional health workers such as ward attendants and cleaners were excluded from the study. A total of 151 were invited and 105 were included in the study. Data was collected using a pre-tested self-administered structured questionnaire. The instrument had sections on socio-demographics, knowledge, perception and practice of COVID-19. The data was analyzed with Statistical Package for the Social Sciences (SPSS) version 23 at a confidence level of 95%. Knowledge was graded into adequate and inadequate based on a total attainable score of 61. A grade of 70% and above was adjudged to be adequate while less than 70% was stated as inadequate. A 5-point Likert scale was used to assess perception and respondents were graded as having good or poor perception based on a maximum attainable score of 35 and a cut off of 70% of the total. Ethical clearance was obtained from the Jos University Teaching Hospital Human Research Ethics Committee and written informed consent was obtained from each respondent.

3. Results

A total of 105 health workers responded to the questionnaire. The mean age of health workers was 42.5 ± 9.2 years. There were slightly more females (58%) than males (42%). Most (66%) were married. Nurses made up 69% of the respondents with varying levels of education as shown in Table 1.

Table 1: Socio-demographic characteristics of respondents

Parameter	Frequency (N = 105)	Percentage (%)
Age		
20-29	7	(6.7)
30-39	38	(36.2)
40-49	25	(23.8)
50-59	35	(33.3)
Sex		
Male	44	(41.9)
Female	61	(58.1)
Marital Status		
Single	19	(18.1)
Married	69	(65.7)
Separated	11	(10.5)
Divorced	2	(1.9)
Widowed	4	(3.8)
Highest Educational Level		
Certificate	7	(6.7)
Diploma	18	(17.1)
Degree	37	(35.2)
Masters	20	(19.0)
PHD	5	(4.8)
Professional Diploma	18	(17.1)
Designation		
Doctor	29	(27.6)
Nurse	72	(68.6)
CHEW	1	(1.0)
Environmental Health Officer	1	(1.0)
Laboratory Technician	2	(1.9)
Years of Service		
0-9	42	(40.0)
10-19	34	(32.4)
20-29	20	(19.0)
30-39	9	(8.6)
LGA of Practice		
Jos North	60	(57.1)
Shendam	11	(10.5)
Pankshin	6	(5.7)
Mangu	1	(1.0)
Barkin Ladi	4	(3.8)
Bassa	2	(1.9)
Riyom	13	(12.4)
Qua'anpan	2	(1.9)
Jos South	4	(3.8)
Jos East	2	(1.0)
Ever participated in COVID-19 training		
Yes	29	(27.6)
No	76	(72.4)

The median years of service was 12 years with more than 70% having worked for 10 – 29 years. The respondents LGAs of practice included ten out of the seventeen LGAs of the State. Slightly over a quarter (27.6%) of them had already done a training on COVID-19 IPC prior to the study.

The most frequently mentioned source of information was the social media (69.5%) as shown in Table 2. Other sources included television (67.6%), radio (65.7), from colleagues, websites of the Nigeria Center for Disease Control (58.1%) and World Health Organization (58.1%), posters/handbills (55.2%), Ministry of Health (46.7%) and also friends (49.5%) and family (37.1%).

Table 2: Sources of information on COVID-19

Sources of information	Frequency (N = 105)	Percentage (%)
NCDC	61	(58.1)
WHO	61	(58.1)
Ministry of Health	49	(46.7)
Radio	69	(65.7)
TV	71	(67.6)
Posters/Hand bills	58	(55.2)
Social Media	73	(69.5)
Colleagues	64	(61.0)
Friends	52	(49.5)
Family	39	(37.1)

All (100%) the respondents agreed that COVID-19 is primarily a disease of the respiratory system. In addition they also stated that it was a disease of the gastrointestinal system (31.4%), immune system (28.6%), muscles (15.2%), heart (8.6%) and brain (6.7%). Modes of transmission of COVID-19 stated by respondents included via droplets (99%), contact (82.9%), airborne transmission (49.5%) and faeco-oral transmission (36.2%). Responses regarding sources of transmission included contaminated surfaces and objects (96.2%), contaminated hands (92.4%), symptomatic persons (91.4%), asymptomatic persons (86.7%), contacts of ill persons (73.3%) and clothes (60%). Symptoms of COVID-19 stated by respondents were difficulty in breathing (98%), fever (95.2%), sneezing (93.3%), dry cough (87.6%), sore throat (87.6%), fatigue (70.5%), headache (69.5%), chest pain (68.6%), diarrhea (47.6%), productive cough (33.3%), vomiting (32.4%), nose bleeds (10.5%) and skin rash (5.7%). Respondents stated that the following groups of people were more likely to present with severe forms of the disease; the elderly (100%), those with co-morbidities (80%), children (31.4%), young adults (9.5%), healthy individuals (5.7%). Recent travel history was believed to be important by 87 (82.8%) of them. Fifty (47.6%) of respondents agreed that COVID-19 has a high mortality rate. Regarding sites for collection of samples for testing, those stated included throat swab (81.9%), nasal swab (76.2%), blood (54.3%) and sputum (46.7%). Protective measures that were stated included regular handwashing (100%), regular use of hand sanitizers (100%), not touching the face, ears and mouth with hands (100%), avoiding crowded spaces (99%),

keeping a distance between oneself and others (99%), observing cough etiquette (98.1%), separating infected persons from healthy ones (95.2%), wearing full protective gear by health workers (94%), wearing of face mask (91.4%), healthy diet (79%), gargling with warm water and salt (30.5%), eating garlic (11.4%), smoking (2.9%), drinking alcohol (1%). The recommended facemask for protection of health workers was agreed to be the N95 respirator by 96 (91.4%) of respondents, 70 (66.7%) agreed that the surgical face mask is recommended while 29 (27.6%) believed the cloth mask was recommended for use. The treatment measures that could be used for patients stated by respondents was thought to be use of ventilators (96.1%), isolation (97.1%), drug treatment regimens (83.8%) and vaccination (20%). (Table 3)

Table 3: Respondents’ knowledge of COVID-19

Parameter	Yes Freq (%)	No Freq (%)	I don’t know Freq (%)
COVID-19 is primarily a disease of			
Respiratory system	105 (100%)	0 (0%)	0 (0%)
GIT system	33 (31.4%)	44 (41.9%)	28 (26.7%)
Immune system	30 (28.6%)	49 (46.7%)	26 (24.8%)
Muscles of the body	16 (15.2%)	63 (60.0%)	26 (24.8%)
Heart	9 (8.6%)	67 (63.8%)	29 (27.6%)
Brain	7 (6.7%)	68 (64.8%)	30 (28.6%)
Mode of transmission			
Droplets	104 (99.0%)	0 (0%)	1 (1.0%)
Contact	87 (82.9%)	8 (7.6%)	10 (9.5%)
Airborne	52 (49.5%)	28 (26.7%)	25 (23.8%)
Faeco-oral	38 (36.2%)	41 (39.0%)	26 (24.8%)
Sources of transmission include			
Contaminated surfaces and objects	101 (96.2%)	1 (1.0%)	3 (2.9%)
Contaminated hands	97 (92.4%)	1 (1.0%)	7 (6.7%)
Symptomatic persons	96 (91.4%)	1 (1.0%)	8 (7.6%)
Asymptomatic persons	91 (86.7%)	4 (3.8%)	10 (9.5%)
Contacts of ill people	77 (73.3%)	11 (10.5%)	17 (16.2%)
Clothes	63 (60.0%)	16 (15.2%)	26 (24.8%)
Recent travel history from the patient is important	87 (82.8%)	1 (1.0%)	17 (16.2%)
Most common symptoms of COVID-19			
Difficulty in breathing	103 (98.0%)	1 (1.0%)	1 (1.0%)
Fever	100 (95.2%)	3 (2.9%)	2 (1.9%)
Sneezing	98 (93.3%)	5 (4.8%)	2 (1.9%)
Dry cough	92 (87.6%)	5 (4.8%)	8 (7.6%)
Sore throat	92 (87.6%)	9 (8.6%)	4 (3.8%)
Fatigue	74 (70.5%)	19 (18.1%)	12 (11.4%)
Headache	73 (69.5%)	18 (17.1%)	14 (13.3%)
Chest pain	72 (68.6%)	18 (17.1%)	15 (14.3%)
Diarrhoea	50 (47.6%)	37 (35.2%)	18 (17.1%)
Productive cough	35 (33.3%)	45 (42.9%)	25 (23.8%)
Vomiting	34 (32.4%)	43 (41.0%)	28 (26.75)
Nose bleeds	11 (10.5%)	59 (56.2%)	35 (33.3%)
Skin rash	6 (5.7%)	72 (68.6%)	27 (25.7%)
Occurrence of severe cases			
The elderly	105 (100.0%)	0 (0.0%)	0 (0.0%)
Those with other co-morbidities	84 (80.0%)	3 (2.9%)	18 (17.1%)
Children	33 (31.4%)	40 (38.1%)	32 (30.5%)
Young adults	10 (9.5%)	64 (61.0%)	31 (29.5%)
Healthy individuals	6 (5.7%)	68 (64.8%)	31 (29.5%)
COVID 19 has a high mortality rate	50 (47.6%)	29 (27.65)	18 (17.1%)

Sample for confirmation is taken from			
Throat swab	86 (81.9%)	7 (6.7%)	12 (11.4%)
Nasal swab	80 (76.2%)	9 (8.6%)	16 (15.2%)
Blood	57 (54.3%)	28 (26.7%)	20 (19.0%)
Sputum	49 (46.7%)	29 (27.6%)	27 (25.7%)
Protective measure against COVID-19			
Regular hand washing	105 (100.0%)	0 (0.0%)	0 (0.0%)
Regular use of hand sanitizers	105 (100.0%)	0 (0.0%)	0 (0.0%)
Not touching your face, ears, mouth with your hands	105 (100.0%)	0 (0.0%)	0 (0.0%)
Avoiding crowded spaces	104 (99.0%)	0 (0.0%)	1 (1.0%)
Keeping a good distance between myself and other people	104 (99.0%)	1 (1.0%)	0 (0.0%)
Observing cough etiquette	103 (98.1%)	0 (0.0%)	2 (1.9%)
Separating those who are infected from healthy people	100 (95.2%)	2 (1.9%)	3 (2.9%)
Wearing full protective gear by health workers	99 (94.3%)	3 (2.9%)	3 (2.9%)
Wearing of face mask	96 (91.4%)	6 (5.7%)	3 (2.9%)
Eating healthy	83 (79.0%)	13 (12.4%)	9 (8.6%)
Gargling with warm water and salt	32 (30.5%)	52 (49.5%)	21 (20.0%)
Eating garlic	12 (11.4%)	65 (61.9%)	28 (16.7%)
Smoking	3 (2.9%)	87 (82.9%)	15 (14.3%)
Drinking alcohol	1 (1.0%)	88 (83.8%)	16 (15.2%)
Recommended face masks for protection against COVID-19 are:			
N95 face mask	96 (91.4%)	3 (2.9%)	6 (5.7%)
Surgical face mask	70 (66.7%)	28 (26.7%)	7 (6.7%)
Cloth mask	29 (27.6%)	53 (50.5%)	23 (21.9%)
Treatment measures for COVID-19			
Isolation	102 (97.1%)	3 (2.9%)	0 (0.0%)
Use of ventilators	101 (96.1%)	1 (1.0%)	3 (2.9%)
Drug treatment regimens	88 (83.8%)	10 (9.5%)	7 (6.7%)
Vaccinations	21 (20.0%)	56 (53.3%)	28 (26.7%)

In Table 4 the level of knowledge is shown to be inadequate in more than half of the health workers (57.1%). It was also found to be significantly related to the level of education and designation of the health workers. Hence, knowledge was more likely to be adequate in those with higher levels of education and better in doctors and nurses than other cadres. Ninety-five (90.4%) of respondents strongly agreed that COVID-19 is real while 1 (1%) was neutral and 2 (1.9%) strongly disagreed. More than 80% strongly agreed that they would self-isolate if asked to do so. Sixty-six (62.8%) strongly agreed that they would attend to a patient suspected to have COVID-19, another 26 (24.8%) agreed to do same. Interestingly only 22.9% strongly agreed that they are well informed about COVID-19. Thirty-six (34.3%) agreed that they are afraid of contracting the disease and a further 12 (11.4%) strongly agreed to their fear of contracting the disease. On immunity to COVID-19, the largest proportion of 39% strongly disagreed that they were immune to contracting the disease. A large proportion of 43.8% disagreed that they were well protected in the work place and a further 25.7% strongly disagreed to that statement. (Table 5)

Table 4: Relationship between knowledge of COVID 19 and certain socio-demographic parameters

	Adequate	Inadequate	Total	df	X²	p-value
Age (Years)	N = 45	N = 60				
20-29	3 (42.9%)	4 (57.1%)	7 (100%)			
30-39	19 (50.0%)	19 (50.0%)	38 (100%)	3	1.870*	0.600
40-49	11 (44.0%)	14 (56.0%)	25 (100%)			
50-59	12 (34.3%)	23 (65.7%)	35 (100%)			
Sex						
Male	21 (47.7%)	23 (52.3%)	44 (100%)	1	0.734	0.392
Female	24 (39.3%)	37 (60.7%)	61 (100%)			
Years of Service						
0-9	16 (38.1%)	26 (61.9%)	42 (100%)			
10-19	18 (52.9%)	16 (47.1%)	34 (100%)	3	3.774*	0.287
20-29	6 (30.0%)	14 (70.0%)	20 (100%)			
30-39	5 (55.6%)	4 (57.1%)	9 (100%)			
Highest Educational Level						
Certificate	0 (0.0%)	7 (100.0%)	7 (100%)			
Diploma	4 (22.2%)	14 (77.8%)	18 (100%)			
Degree	20 (54.1%)	17 (45.9%)	37 (100%)	5	17.848*	0.003
Masters	11 (55.0%)	9 (45.0%)	20 (100%)			
PhD	4 (80.0%)	1 (20.0%)	5 (100%)			
Professional Diploma	6 (33.3%)	12 (66.7%)	18 (100%)			
Designation						
Doctor	23 (79.3%)	6 (20.7%)	29 (100%)			
Nurse	21 (29.2%)	51 (70.8%)	72 (100%)			
CHEW	0 (0.0%)	1 (100.0%)	1 (100%)	4	26.918*	<0.001
Environmental Health Officer	1 (100.0%)	0 (0.0%)	1 (100%)			
Lab Tech	0 (0.0%)	2 (100.0%)	2 (100%)			
Participated in Training on COVID 19						
Yes	14 (48.3%)	15 (51.7%)	29 (100%)			
No	31 (40.8%)	45 (59.2%)	76 (100%)	1	0.480	0.488
Total	45 (42.9%)	60 (57.1%)	105 (100%)			

*Adjusted chi-square

**Fisher's Exact

Table 5: Perception of COVID-19 by respondents

Parameter	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
COVID-19 is real	95 (90.4%)	7 (6.7%)	1 (1.0%)	0 (0.0%)	2 (1.9%)
I am willing to self-isolate if I am asked to do so	86 (81.9%)	16 (15.2%)	2 (1.9%)	0 (0.0%)	1 (1.0%)
If given full PPE, I am willing to attend to a patient that is suspected to have COVID-19	66 (62.8%)	26 (24.8%)	9 (8.6%)	2 (1.9%)	2 (1.9%)
I believe I am well informed about COVID-19	24 (22.9%)	58 (55.2%)	8 (7.6%)	13 (12.4%)	2 (1.9%)
I am afraid I may contract the disease	12 (11.4%)	36 (34.3%)	28 (26.7%)	22 (21.0%)	7 (6.7%)
I am immune to COVID-19	2 (1.9%)	2 (1.9%)	22 (21.0%)	38 (36.2%)	41 (39.0%)
I am sufficiently protected in my workplace to handle a COVID-19 patient	2 (1.9%)	15 (14.3%)	15 (14.3%)	46 (43.8%)	27 (25.7%)

A total of 92 (86.6%) respondents were assessed to have a good perception towards COVID-19. (Table 6) Perception was not found to be significantly associated with any of the socio-demographic parameters. There was also no association between perception and knowledge ($p > 0.05$). Personal practices of the health workers to protect themselves against COVID-19 infection are shown in Table 7. Sixty-seven (63.8%) of them 'always' have a hand sanitizer with them. Being able to maintain a 1 -2 meter physical distance from colleagues at work is possible for 81.9% of them 'sometimes', and similarly from others (81%). Only 15.2% are able to avoid touching their faces 'always'. Regarding cough etiquette, 'sometimes' 71 (67.6%) would cough into a tissue and 41% into their bent elbow. After use of a tissue 30 (28%) would 'always' dispose into a covered bin and 67 (63.8%) would 'always' wash their hands afterwards. For practices directly affecting their work place, 72.4% stated that they had never had training on how to put on a full personal protective equipment (PPE) kit. Despite this, 54.3% were confident that if needed, they would be able to do so. One form of PPE or the other was available to 70 (66.7%) of the respondents at their workplace. The form of PPE most available to them were the face masks (70.5%). Others were the hair covers (39%), aprons (37.1%), goggles/face shields (35.2%), overalls (34.3%) and shoe coverings (30.5%). Sixty-six (62.9%) stated that they have a protocol in their facility to guide them on what to do with a suspected case. A scenario was included for respondents to state what they would do, in all the sections more than 95% stated the accurate steps to take.

Table 6: Relationship between perception of COVID 19 and certain socio-demographic characteristics

	Good N = 92	Poor N = 13	Total N = 105	df	X²	p-value
Age (Years)						
20-29	5 (71.4%)	2 (18.6%)	7 (100%)	3	4.332*	0.228
30-39	34 (89.5%)	4 (10.5%)	38 (100%)			
40-49	20 (80.0%)	5 (20.0%)	25 (100%)			
50-59	33 (94.3%)	2 (5.7%)	35 (100%)			
Sex						
Male	40 (90.9%)	4 (9.1%)	44 (100%)	1	0.756	0.385
Female	52 (85.2%)	9 (14.8%)	61 (100%)			
Years of Service						
0-9	36 (85.7%)	6 (14.3%)	42 (100%)	3	2.645*	0.450
10-19	30 (88.2%)	4 (11.8%)	34 (100%)			
20-29	17 (85.0%)	3 (15.0%)	20 (100%)			
30-39	9 (100.0%)	0 (0.0%)	9 (100%)			
Highest Educational Level						
Certificate	5 (71.4%)	2 (28.6%)	7 (100%)	5	3.761*	0.584
Diploma	17 (94.4%)	1 (5.6%)	18 (100%)			
Degree	32 (86.5%)	5 (13.5%)	37 (100%)			
Masters	17 (85.0%)	3 (15.0%)	20 (100%)			
PhD	5 (100.0%)	0 (0.0%)	5 (100%)			
Designation						
Doctor	23 (79.3%)	6 (20.7%)	29 (100%)	4	3.138*	0.535
Nurse	65 (90.3%)	7 (9.7%)	72 (100%)			
CHEW	1 (100.0%)	0 (0.0%)	1 (100%)			
Environmental Health Officer	1 (100.0%)	0 (0.0%)	1 (100%)			
Lab Tech	2 (100.0%)	0 (0.0%)	2 (100%)			
Participated in Training on COVID 19						
Yes	26 (89.7%)	3 (10.3%)	29 (100%)			1.000**
No	66 (86.8%)	10 (13.2%)	76 (100%)			
Knowledge of COVID-19						
Adequate	38 (84.4%)	7 (15.6%)	45 (100%)	1	0.732	0.392
Inadequate	54 (90.0%)	6 (10.0%)	60 (100%)			

*Adjusted Chi square

**Fisher's Exact

Table 7: Practices of respondents

Parameter	Always	Sometimes	Never
How often do you have a hand sanitizer with you	67 (63.8%)	36 (34.2%)	2 (1.9%)
Do you cough or sneeze into your bent elbow	59 (56.1%)	43 (41.0%)	3 (2.9%)
Do you cough and sneeze into tissue	30 (28.6%)	71 (67.6%)	4 (3.8%)
Do you dispose the tissue into a covered bin	64 (60.9%)	36 (34.3%)	5 (4.8%)
Do you wash your hands afterwards	67 (63.8%)	36 (34.3%)	2 (1.9%)
Are you able to avoid touching your face with your hands	16 (15.2%)	83 (79.0%)	6 (5.7%)
Are you able to keep a 1-2 meter distance from other people at most times	14 (13.3%)	86 (81.9%)	5 (4.8%)
Are you able to maintain a 1-2 meter physical distance with colleagues at work	12 (11.4%)	85 (81.0%)	7 (6.7%)
Parameter	Yes	No	
Have you ever been trained on how to put on full PPE	29 (27.6%)	76 (72.4%)	
Are you confident of your ability to put on the full PPE	57 (54.3%)	48 (45.7%)	
Is PPE available to you at your work place	70 (66.7%)	35 (33.3%)	
Availability of PPEs			
Availability of face mask	74 (70.5%)	31 (29.5%)	
Availability of hair cover	41 (39.0%)	64 (61.0%)	
Availability of apron	39 (37.1%)	66 (62.9%)	
Availability of goggles/face shield	37 (35.2%)	68 (64.8%)	
Availability of overalls	36 (34.3%)	69 (65.7%)	
Availability of shoe covering	32 (30.5%)	73 (69.5%)	
Do you have the contact numbers of the health authorities to call when you suspect a patient has COVID-19	59 (56.2%)	46 (43.8%)	
Do you have a protocol in your facility to guide you on what to do with a suspected case of COVID-19	66 (62.9%)	39 (37.1%)	
A 45 year old man comes to your health facility with a history of cough, difficulty in breathing and fever. He had returned from the UK 3 weeks earlier. Which of the following actions are you likely to take?			
Separate the man from other patients	101 (96.2%)	4 (3.8%)	
Ensure you have a PPE then proceed to attend to the patient	100 (95.2%)	5 (4.8%)	
Call the State emergency numbers for COVID-19	100 (95.2%)	5 (4.8%)	
Offer the patient a face mask	98 (93.3%)	7 (6.7%)	
Refuse to attend to the patient	2 (1.9%)	103 (98.1%)	
Ask the patient to go to another hospital	1 (1.0%)	104 (99.0%)	

4. Discussion and Conclusion

The Covid-19 pandemic has placed health care workers in a particularly vulnerable position as they battle a disease that is still in its evolutionary phase regarding the facts about the virus, forms of presentation and management of affected persons. This study found an inadequate level of knowledge regarding COVID-19 among health workers. This brings to the fore the urgent need to expose health workers in the State to adequate and reliable information. This finding is however in contrast to other findings in Nigeria and Ghana which found that most of the health workers studied had adequate knowledge of COVID-19 [19,20]. Despite this difference these studies also found gaps and inconsistencies in the knowledge of health workers as seen in this study. These include items such as uncertainty about the disease being primarily respiratory, almost half believing that the disease has a high mortality rate and uncertainty about the symptoms and where samples for testing are taken from. The most frequent source of information was from the social media followed closely by the mass media and from colleagues. The social media has been awash with dissemination of unverified information [21,22]. It is expected that health workers should be armed with accurate information with which to give lay persons and which will influence their response. Reliance on the social media for information may contribute to the inconsistencies that were evident in their knowledge responses. Most of the respondents had also never had any IPC training for COVID-19. Hence the initiative by the State government to train HCWs who will in turn step down their training at their centers was an initiative that will add value to the control measures in the area. Knowledge was associated with level of education and designation of the health worker, a similar finding of the study in Ghana [20]. Educational level is a frequently found determinant of knowledge in health an health-related matters with higher levels of education showing better health knowledge and ultimately better health behaviours [23,24,25,26]. Similarly the designation of health workers has also been seen to influence the level of their knowledge in health matters with doctors and nurses usually showing better knowledge in health topics of interest [27,28,29]. Despite having inadequate knowledge, most of the respondents had a good perception and no association was found between the two parameters. A finding that has been repeatedly found in other studies where health workers have a positive attitude towards COVID-19 despite not having sufficient knowledge about the disease [30,31,32]. Their responses showed that they recognized that they are at risk of contracting the disease and were willing to take necessary steps to protect others if they should become infected. They were mostly also willing to attend to patients who were confirmed COVID-19 cases if they were given full PPE. A finding that is in contrast to that documented for a study conducted in the south-south region of Nigeria where the health workers showed an unwillingness to attend to COVID-19 patients even if compensation was offered [19]. Unfortunately many of the participants in this study believed that they were not well protected at their work places and this may hinder them from providing the service required for patients. This belief may also be what is fueling their fear about contracting the disease as was reported in another study conducted in Egypt where lack of PPE in the work place was one of the reasons that made HCWs afraid of contracting the disease [33]. Most of the respondents had never been trained in the use of PPE, though many were confident that they can put it on if the need arose. The training of health workers in the use of PPE has been found to lower the risk of contracting COVID-19 especially when combined with IPC training as documented in a review funded by the WHO [34]. Though more than 60% stated that PPE's were available for them at their workplaces, further analysis showed that the face mask was the most commonly available. Less than 40% had access to the other

forms of PPE. The lack of PPE for health workers is an issue that is not peculiar to Nigeria as governments are facing worldwide shortages which has served to undermine efforts to protect HCWs from contracting COVID-19 as they attend to patients [35]. For COVID-19 it has been noted that “adequate training and uninterrupted availability of sufficient, adequate PPE protects healthcare workers from harm” [36]. Hence a worldwide shortage does not excuse governments from fulfilling their obligations towards HCWs [37]. Various strategies have been given for governments and hospital managements to overcome these challenges [38,39]. An assessment of their personal preventive practices showed that more than half were consistent on use of hand sanitizers, cough etiquette, disposal of used tissue and hand hygiene. However, physical distancing and avoidance of touching the face with the hands was more challenging. These variations in good practice has been seen in other studies where some practices are adhered to more than others [20,31]. A facility protocol was available to more than 60% of them in their facilities indicating that managements of healthcare facilities were taking steps to ensure the proper handling and management of suspected cases. However, the numbers of health authorities to call for identified suspected case was known to just a little over 50% of them. This means more effort is required by the responsible authorities to ensure that this information is freely available to all but in particular the health workers who are the frontline in the pandemic. When a practical scenario was provided almost all the respondents gave the accurate steps to take. This was an encouraging finding, hence even though knowledge regarding this particular disease may not be adequate health workers could rely on basic medical training to manage cases that present to them. The use of a purposive sampling technique is a limitation of this study as those included in the study were not representative of all the various cadres of health workers found in the State, hence of the findings may likely not be generalizable to all of them. However, this study has highlighted the ill-preparedness of health workers in the State in terms of knowledge, skills and protective equipment to face the COVID-19 pandemic. While this is typical of most developing countries, including Nigeria whose health system is weak [40]. the encouragement is that the health workers remain determined in the face of these inadequacies to confront the pandemic with the available resources.

5. Recommendations

Reliable and accessible information, personal protective equipment and improvement in practices are needed to ensure healthcare worker preparedness in battling this pandemic.

Acknowledgement

Our appreciation goes to the Plateau State branches of our various associations; Nigerian Medical Association (NMA), Pharmaceutical Society of Nigeria (PSN), National Association of Nigeria Nurses and Midwives (NANNM), Association of Medical Laboratory Scientists of Nigeria (MLSN) for bringing this group together and trusting us with the mandate to initiate and participate in control activities for the COVID-19 pandemic.

6. Conflict of interest

We the authors declare that we have no financial or personal relationship(s) which may have inappropriately influenced the writing of this paper.

References

- [1]. World Health Organization (WHO). “Coronavirus.” Internet: https://www.who.int/health-topics/coronavirus#tab=tab_1, [9 Jun, 2020].
- [2]. M.A. Shereen, S. Khan, A. Kazmi, N. Bashir, R. Siddique. (2020, Jul.). “COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses.” *Journal of Advanced Research*. [Online]. 24, pp. 91–8. Available: <https://doi.org/10.1016/j.jare.2020.03.005>, [Jul. 28, 2020].
- [3]. World Health Organization (WHO). “WHO Coronavirus Disease (COVID-19) dashboard.” Internet: <https://covid19.who.int/table>, Aug. 16, 2020 [Aug. 16, 2020].
- [4]. S.A. Lone and A. Ahmad. (2020, Jun.). “COVID-19 pandemic – an African perspective.” *Emerging Microbes & Infection*. [Online]. 9(1), pp. 1–28. Available: <https://www.tandfonline.com/doi/full/10.1080/22221751.2020.1775132> [Jul. 8, 2020]
- [5]. Nigeria Center for Disease Control (NCDC). “Covid-19 Nigeria.” Internet: <https://covid19.ncdc.gov.ng/report/>, [Jun. 10, 2020].
- [6]. S.P. Adhikari, S. Meng, Y. Wu, Y. Mao, R. Ye, Q. Wang, C. Sun, S. Sylvia, S. Rozelle, H. Raat and H. Zhou. (2020, Mar.). “Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period : a scoping review.” *Infectious Disease of Poverty*. [Online]. 9(29). Available: <https://doi.org/10.1186/s40249-020-00646-x> [Jun. 10, 2020]
- [7]. H. Ge, X. Wang, X. Yuan, G. Xiao, C. Wang, T. Deng, Q. Yuan and X. Xiao. (2020, Apr.). “The epidemiology and clinical information about COVID-19.” *European Journal of Clinical Microbiology & Infectious Diseases*. [Online]. 39(6), pp. 1011–1019. Available: <https://doi.org/10.1007/s10096-020-03874-z> [Jun. 10, 2020]
- [8]. World Health Organization (WHO). “Modes of transmission of virus causing COVID-19 : implications for IPC precaution recommendations.” WHO Scientific brief: <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>, Jul. 9, 2020 [Jul. 28, 2020]
- [9]. M. Cascella, M. Rajnik, A. Cuomo, S.C. Dulebohn, R.D. Napoli. (2020, Jul 4). *Features, Evaluation and Treatment Coronavirus (COVID-19).* (1st edition). [Online]. pp. 1-20. Available: <https://www.ncbi.nlm.nih.gov/books/NBK554776/> [Jun 9, 2020].
- [10]. Centers for Disease Control and Prevention (CDC). “Interim clinical guidance for management of patients with confirmed coronavirus disease (COVID-19).” Internet: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html>, Jun. 30, 2020 [2020 Jun. 9].
- [11]. S. Nikhat and M. Fazil. (2020, Aug.) “Overview of Covid-19 ; its prevention and management in the light of Unani medicine.” *Science of the Total Environment*. [Online]. 728, pp. 138859. Available from: <https://www.sciencedirect.com/science/article/pii/S0048969720323767>. [2020 Jun. 9].
- [12]. B.L. Zhong, W. Luo, H.M. Li, Q.Q. Zhang, X.G. Liu, W.T. Li, Y. Li. (2020. Mar.) “Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey.” *International Journal of Biological*

- Sciences. [Online] 16(10), pp. 1745–1752. Available: <https://doi.org/10.7150/ijbs.45221>. [2020 Jun. 9].
- [13]. A.A. Azlan, M.R. Hamzah, T.J. Sern, S.H. Ayub, E. Mohamad. (2020, May.) “Public knowledge, attitudes and practices towards COVID-19: a cross-sectional study in Malaysia.” *PLOS One*. [Online]. 15(5), e0233668. Available: <https://dx.plos.org/10.1371/journal.pone.0233668>. [Jun. 9, 2020].
- [14]. M. Zhang, M. Zhou, F. Tang, Y. Wang, H. Nie, L. Zhang and G. You. (2020, Jun.) “Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China.” *The Journal of Hospital Infection*. [Online]. 105(2), pp. 183–187. Available: <https://doi.org/10.1016/j.jhin.2020.04.012>. [2020 Jun. 9].
- [15]. H. Sahni and H. Sharma. (2020, Jun.). “Role of social media during the COVID-19 pandemic: Beneficial, destructive, or reconstructive?” *International Journal of Academic Medicine*. [Online]. 6, pp.70-75. Available: <http://www.ijam-web.org/text.asp?2020/6/2/70/287959>. [Jul. 29, 2020].
- [16]. E. Coiera. “Communication systems in healthcare.” *The Clinical Biochemist Review*, vol. 27(2), pp. 89–98, May. 2006.
- [17]. Government of Plateau State of Nigeria. “Plateau State at a glance.” Internet: Available: <https://www.plateaustate.gov.ng/>, 2019 [Apr. 6, 2020].
- [18]. Nigeria Federal Ministry of Health. “Nigeria health facility registry.” Internet: <https://hfr.health.gov.ng/statistics/tables>, 2019 [Jul. 27, 2020].
- [19]. M.P. Ogolodom, A.N. Mbaba, N. Alazigha, O.F. Erundu, N.O. Egbe, I. Golden, D.C. Ugwuanyi, G.I. Achi and C.M. Eke. (2020, Jun.) “Knowledge, attitudes and fears of healthcare workers towards the corona virus disease (COVID-19) pandemic in South-South, Nigeria.” *Health Science Journal*. [Online] Sp. Iss 1: 002. Available: DOI: 10.36648/1791-809X.S1. [Jul. 26, 2020].
- [20]. C. Nkansah, D. Serwaa, L.A. Adarkwah, F. Osei-Boakye, K. Mensah, P. Tetteh, S. Awudu, A. Apodola. (2020, Jun.) “Novel coronavirus disease 2019: knowledge, practice and preparedness: a survey of healthcare workers in the Offinso-North District, Ghana.” *Pan African Medical Journal*. [Online]. 35(2), pp. 79. Available: doi: 10.11604/pamj.supp.2020.35.2.23644. [Jul. 25, 2020].
- [21]. G. Pennycook, J. McPhetres, Y. Zhang, J. G. Lu and D. G. Rand. (2020, Jun) “Fighting COVID-19 misinformation on social media: experimental evidence for a scalable accuracy-nudge intervention.” *Psychological Science*. [Online]. 31(7), pp.770–780. Available: <https://doi.org/10.1177/0956797620939054>. [Jul 27, 2020].
- [22]. W. Hussain. (2020, Apr.) “Role of social media in COVID-19 pandemic.” *The International Journal of Frontier Sciences*. [Online]. 4(2). Available: <https://doi.org/10.37978/tijfs.v4i2.144>. [Jul. 27, 2020].
- [23]. L. Feinstein, R. Sabates, T. Anderson, A. Sorhaindo and C. “Measuring the effects of education on health and civic engagement,” in *Proceedings of the Copenhagen symposium, 2006*, pp. 171-354.
- [24]. Raghupathi, V., Raghupathi, W. (2020, Apr.). “The influence of education on health: an empirical assessment of OECD countries for the period 1995–2015.” *Archives of Public Health* [Online]. 78(20). Available: <https://doi.org/10.1186/s13690-020-00402-5>. [Aug. 21, 2020].
- [25]. E. Zimmerman and S. H. Woolf. “Understanding the relationship between education and health. Discussion paper, Institute of Medicine, Washington, DC.” Internet: <http://nam.edu/wp-content/uploads/2015/06/understandingtherelationship>, 2014 [Aug. 21, 2020].

- [26]. R. Hoffmann, R and S.U. Lutz. (2019, Feb.). "The health knowledge mechanism: evidence on the link between education and health lifestyle in the Philippines." *European Journal of Health Economics*. [Online]. 20, pp. 27–43. Available: <https://doi.org/10.1007/s10198-017-0950-2> [Aug. 21, 2020].
- [27]. M.S. Iqbal, M.B. Bahari, M.Z. Iqbal, M.W. Iqbal, S. Nasir. (2015, May.). "Evaluation of knowledge, attitudes, and practices of healthcare providers towards nutrition support in Pakistan." *Value in Health*. 18(3), pp. A98-A99. Available: <https://doi.org/10.1016/j.jval.2015.03.577> [Aug. 21, 2020].
- [28]. M.A. Baseer, M.S. Alenazy, M. Alasqah, M. Algabbani, A. Mehkari. "Oral health knowledge, attitude and practices among health professionals in King Fahad Medical City, Riyadh." *Dental Research Journal*, vol 9, iss 4, pp. 386-392, Jul. 2012.
- [29]. C.H. Ngwa, E.A. Ngho, S. N. Cumber. (2018, Oct.). "Assessment of the knowledge, attitude and practice of health care workers in Fako Division on post exposure prophylaxis to blood borne viruses: a hospital based cross-sectional study." *Pan African Medical Journal*. [Online]. 31, pp. 108. Available: <https://doi.org/10.11604/pamj.2018.31.108.15658> [Aug. 21, 2020].
- [30]. A.S. Bhagavathula, W.A. Aldhalei, J. Rahmani, M.A. Mahabadi and D. K. Bandari. (2020, Apr.) "Knowledge and perceptions of COVID-19 among health care workers: cross-sectional study." *JMIR Public Health Surveillance*. [Online]. 6(2), pp. e19160. Available: <https://doi.org/10.2196/19160>. [Jul. 26, 2020].
- [31]. M. Saqlain, M.M. Munir, S.U. Rehman, A. Gulzar, S. Naz, Z. Ahmed, A.H. Tahir and M. Mashhood. (2020, Jul.) "Knowledge, attitude, practice and perceived barriers among healthcare workers regarding COVID-19: a cross-sectional survey from Pakistan." *The Journal of Hospital Infection*. [Online]. 105(3), pp. 419e423. Available: <https://doi.org/10.1016/j.jhin.2020.05.007>. [Jul. 26, 2020].
- [32]. R. Olum, G. Chekwech, G. Wekha, D.R. Nassozi and F. Bongomin. (2020, Apr.) "Coronavirus Disease-2019: knowledge, attitude, and practices of health care workers at Makerere University Teaching Hospitals, Uganda." *Frontiers in Public Health*. [Online]. Available: <https://doi.org/10.3389/fpubh.2020.00181>. [Jul. 30, 2020].
- [33]. W.Y. Abdel Wahed, E.M. Hefzy, M.I. Ahmed and N.S. Hamed. (2020, Jul.) "Assessment of knowledge, attitudes, and perception of health care workers regarding COVID-19, a cross-sectional study from Egypt." *Journal of Community Health*. [Online]. Available: <https://doi.org/10.1007/s10900-020-00882-0>. [Jul. 26, 2020].
- [34]. R. Chou, T. Dana, D.I. Buckley, S. Selph, R. Fu, A.M. Totten. (2020, Jul.) "Epidemiology of and risk factors for coronavirus infection in health care workers." *Annals of Internal Medicine*. [Online]. 173(2), pp. 120-136. <https://doi.org/10.7326/M20-1632> [Aug. 21, 2020].
- [35]. M. Mhango, M. Dzobo, I. Chitungo, T. Dzinamarir. (2020, Jun.) "COVID-19 risk factors among health workers: a rapid review." *Safety and Health at Work*. Available: <https://doi.org/10.1016/j.shaw.2020.06.001> [Jul. 27, 2020]
- [36]. U. Karlsson and C. Fraenkel. (2020, Jul.) "Complete protection from covid-19 is possible for health workers." *The BMJ*. [Online]. 370, pp. m2641. Available: <https://doi.org/10.1136/bmj.m2641>. [Jul. 27, 2020]
- [37]. World Health Organization (WHO). "Coronavirus disease (covid-19) outbreak: rights, roles and responsibilities of health workers, including key considerations for occupational safety and health."

- Internet: https://www.who.int/docs/default-source/coronaviruse/who-rights-roles-respon-hw-covid-19.pdf?sfvrsn=bcabd401_0. [Jul. 27, 2020].
- [38]. Centers for Disease Control and Prevention (CDC). “Optimizing supply of PPE and other equipment during shortages.” Internet: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html>, Jul. 16, 2020 [Jul. 27, 2020].
- [39]. UNICEF. “COVID-19 impact assessment and outlook on personal protective equipment.” Internet: <https://www.unicef.org/supply/stories/covid-19-impact-assessment-and-outlook-personal-protective-equipment>, [Jul. 27, 2020].
- [40]. D. Adeloje, R.A. David, A.A. Olaogun, A. Auta, A. Adesokan, M. Gadanya, J. K. Opele, O. Owagbemi and A. Iseolorunkanmi. (2017, May.). “Human resources for health. Health workforce and governance: the crisis in Nigeria.” *Human Resources for Health*. [Online]. 15(32). Available: <https://doi.org/10.1186/s12960-017-0205-4> [Aug. 21, 2020].