

## Coronavirus Pandemic

# COVID-19 infection: Knowledge, attitude, practices, and impact among healthcare workers in a South-Eastern Nigerian state

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### Abstract

**Introduction:** The coronavirus disease (COVID-19) infection rate and mortality among Nigerian health care workers appear to be on the increase. This study determined the level of knowledge, attitude, practices, and impact of COVID-19 infection on healthcare workers (HCWs) working in a South-Eastern Nigerian state.

**Methodology:** This was a web-based, cross-sectional study conducted among healthcare workers in South-eastern, Nigeria during the lockdown period. Socio-demographic profile, knowledge of COVID-19, fears and impact concerning COVID-19, attitude of health workers to work, preventive practices during this pandemic period were obtained. Data were analysed using STATA 16.0. Chi-square and Fisher's exact tests of association were used to determine the association between variables, with the significance level set at  $p < 0.05$ .

**Results:** A total of 403 health care workers participated in the study. Majority of participants ( $n = 357$ , 88.59%) had good knowledge and good preventive practices ( $n = 328$ , 81.39%) of COVID-19. A significant proportion of respondents had a poor attitude to work ( $n = 101$ , 25.06%) and an attitude of indifference ( $n = 233$ , 57.82%). Almost half (48.64%) of participants had been negatively affected by COVID-19. Knowledge significantly influenced practice ( $p = 0.029$ ). Lack of Personal protective equipment, fear of dying and going to common places, had a significant impact on the attitude of workers.

**Conclusion:** Good knowledge which influenced practice, high use of preventive practices, with associated poor and indifferent attitude was noted among healthcare workers. Fear of death and lack of personal protective equipment had a strong impact on attitude. Female HCWs had poorer attitude to work than males.

**Key words:** knowledge; attitude; practice; healthcare workers; COVID-19; Nigeria.

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### Introduction

In December 2019, a novel disease called ‘Coronavirus disease 2019’ involving the respiratory tract emerged and was first detected in Wuhan, China [1]. It is popularly known by its short-form COVID-19. With its emergence, there has been a lot of fear, anxiety, and panic, with controversies about its nature, origin, aetiology, prevention, and treatment. On the 11<sup>th</sup> of

March, 2020, the World Health Organisation (WHO) declared it a global pandemic [2]. Facts on COVID-19 are rapidly evolving and it is now known that there can be a presymptomatic, symptomatic, and asymptomatic transmission [3]. It can also be transmitted through other sites apart from the respiratory route [4]. The symptoms usually develop about 5- 6 days after infection, and the incubation period may range between

1-3 to 14 days [5]. Symptoms vary among individuals and include myalgia, shortness of breath, fatigue, sore throat, fever, tonsil enlargement, cough (dry or productive), headache, common-cold symptoms (runny nose, sneezing), diarrhoea, haemoptysis and can also affect other organ systems such as the liver, heart, kidneys [4-7]. The infectivity rate is high, evidenced by the rapid rise in the number of cases over a very short period [8]. The death toll from this disease which was previously seen as non-fatal, has equally risen among nations, with some countries being worse hit than others [9]. The first case of COVID-19 was reported in Nigeria on 27<sup>th</sup> February 2020 and since then, there has been a steady rise in both the number of cases and deaths from the disease [10]. Presently, in Nigeria, there are greater than 13000 cases, and more than 360 people have died from the disease [11]. There are insinuations and assumptions that due to Nigeria's gross under testing, the number of cases could be a lot more than is being reported [12]. Community spread is a likely event in Nigeria especially with the high level of poverty. This, and the fact that the health care systems are ill-equipped, have been postulated as going to be responsible for an increase in the number of cases, and mortality from COVID-19 in sub-Saharan Africa [13]. This disease has claimed the lives of as much as 1000 health care workers and frontline staff all over the world, even in equipped and developed nations with an estimated 450,000 infected HCWs [14,15]. In certain media publications, it has been estimated that about 812 Nigerian healthcare workers (HCWs) have been infected, while it is uncertain how many have died from COVID-19 [16,17]. All these have caused a great wave of fear and panic among citizens, augmented by the wave of true and false information being disseminated on social media. The World Health Organisation (WHO), Centre for Disease Control (CDC), Nigeria Centre for Disease Control (NCDC), and other health regulatory bodies have recommended thorough, frequent hand washing using soap and water or alcohol-based hand sanitizers, maintaining a distance of at least two metres between oneself and someone coughing or sneezing, respiratory hygiene, avoidance of large crowds, and more recently, the use of facemasks as a means to control the communal spread of COVID-19 [5,18-21]. It is uncertain whether the recommendations are being adhered to. COVID-19 poses a huge threat to hospital staff because of their constant exposure to infected persons and so, it is imperative that HCWs are protected and disease transmission in hospitals prevented. Knowledge, attitude, and practices on COVID-19 may vary among individuals, communities,

nations, and even among health institutions [22-26]. Bhagavathula *et al.* [22] in a survey among HCWs reported poor knowledge of Coronavirus disease among health care workers globally. Healthcare workers are central in the fight against COVID 19 infection as they offer treatment, which makes them vulnerable to the disease [27]. Their knowledge, attitude, and practice of the preventive measures may play important role in limiting the infection among health workers and reducing the spread to patients, family, and the community. Inadequate knowledge among HCWs will lead to a delay in recognition and diagnosis, which may increase transmission among staff and further spread in the communities [28]. Nigeria, in addition to some other countries, has employed a partial or even complete lockdown in order to mitigate its spread [29,30].

From a literature search, few studies have been conducted in Africa on the subject matter. None has been done in Nigeria. This study aimed to determine the knowledge, attitude, and practices of healthcare providers during this COVID-19 pandemic. This will aid the strengthening of weak areas to ensure a reduction in disease burden among HCWs and the community.

## Methodology

This was a web based, cross-sectional study conducted over one month from 16<sup>th</sup> April to 12<sup>th</sup> May 2020. The study participants were consenting healthcare workers (medical doctors, nurses, pharmacists, lab scientists), and other professionals working in the health unit (records officers, porters, cleaners, and messengers) in Anambra State, South-East, Nigeria during the lockdown period.

### Sample size

The sample size was calculated using the formula [31]  $n = \frac{Z^2 P(1-P)}{d^2}$  where n is the minimum sample size. Z is the normal standard deviate corresponding to a significance level. For a significance level/precision of 5%, Z = 1.96, P is the estimated proportion from a previous study set at 61% [27]. This gave a minimum sample size of 365. An extra 10% was added for questionnaires that were filled wrongly, giving a calculated sample size of 402. Four hundred and three healthcare workers participated in the study.

### Study instrument and Data collection

An online, self-administered semi-structured questionnaire was adapted from Almutairi *et al.* [32] and modified. It was made accessible using a link

(Google form link) shared by the researchers (health professionals), using Whatsapp Messenger (Facebook, Inc., California, Menlo Park, USA) to the different healthcare workers/allied workers' social media groups and individual mobile phones during the period of the lockdown. Only consenting health professionals/ other professionals working in the health units in the Federal Tertiary Health institution, State tertiary health institution, General hospitals, private health institutions, primary health care facilities and mission hospitals in Anambra state were eligible. Google form which was used for this survey provides instant messaging and cloud storage of data for easy accessibility, and analysis. The questionnaire was divided into 4 parts which included sociodemographic characteristics of participants, Knowledge of COVID-19 (8 items), Attitude of HCW (3 items), Practices during the COVID-19 pandemic (6 items). For knowledge, we adapted an 8-item questionnaire from Zhong *et al.* [1], which was reformed for the HCWs. The questions asked comprised awareness of the disease (2 points), source of knowledge (2 points), cause of the disease (3 points), modes of transmission (maximum of 5 points), severity (1 point if response was 'very dangerous'; 2 points if 'mild or moderately dangerous'), symptoms (maximum of 8 points), incubation period (3 points), prevention (maximum of 5 points). A total score of less than or equal to 10 was adjudged as poor knowledge, 11-20 was average knowledge, and 21-30 as good knowledge.

In the section on Attitude, questions asked were: preference to stay at home, afraid to come to work, and low zeal for the work previously enjoyed. Each was scored using the reverse Likert 5 point scale as follows: "never"-5, "occasionally"- 4, "sometimes"-3, "often"-2, "always"- 1. The attitude was scored as poor if the participant had a total of 1-5 points, indifferent/neutral if the score was 6-10 points, and good if participants had 11-15 points.

A 6-item questionnaire was adapted from Almutairi *et al.* [32] to categorize the level of practice. Questions included the use of face masks, avoiding touching the face, observation of cough and sneeze hygiene, washing hands with soap and water, avoidance of overcrowded places, and maintenance of 1 meter physical distance. They were assessed using a Likert 5 point scale scored 1-5 respectively depending on the response (never, occasionally, sometimes, often, and always). The practice was ascribed as low level (1-10 points), moderate level (11-20 points), and high level (21-30 points). Questions on fears and impact were coded into 'Yes' and 'No' responses in Microsoft excel before

entry into STATA for analysis (Supplementary file). All data downloaded from the Google form were coded and cleaned up in Microsoft excel before data analysis. Wrongly filled forms were excluded before analysis. The study was conducted following the Declaration of Helsinki. Ethical approval for the study was obtained from the Ethics and Research committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi (NAUTH/CS/66/VOL.13/35/2020/028). Participants were not paid for participating in this study.

### Data Analysis

Data was analysed using STATA software version 16.0. Numerical variables like age were summarized using mean and standard deviation. Age was further categorized during analysis. Categorical variables such as gender, age group, marital status, tribe, profession,

**Table 1.** Sociodemographic characteristics of Healthcare workers.

Variables	Frequency, n (%)
<b>Age ranges (years)</b>	
< 20	2 (0.50)
20-30	111 (27.54)
31-40	153 (37.97)
41-40	91 (22.58)
51-60	29 (7.20)
> 60	2 (0.50)
Missing value	15 (3.72)
<b>Gender</b>	
Male	184 (45.66)
Female	219 (54.34)
<b>Tribe</b>	
Igbo	398 (98.76)
Yoruba	1 (0.25)
Hausa	1 (0.25)
Others	3 (0.74)
<b>Partnership status</b>	
With partner	260 (64.52)
Without partner	143 (35.48)
<b>Profession</b>	
Doctor	182 (45.16)
Nurse	60 (14.89)
Lab scientist	49 (12.16)
Pharmacist	93 (23.08)
Others	19 (0.25)
<b>Years of experience (years)</b>	
< 5	129 (32.01)
5-9	71 (17.62)
≥ 10	203 (50.37)
<b>Denomination</b>	
Catholic	208 (51.61)
Anglican	106 (26.30)
Pentecostal	85 (21.09)
Jehovah witness	4 (0.99)
<b>Total</b>	<b>403 (100.0)</b>

denomination, and years of experience were summarized using frequency and percentages. Cross tabulation was used to determine the relationship between socio-demographic variables (gender, age group, partnership status, profession, denomination, and years of experience) and knowledge, attitude, and practice using Chi-Square. Where applicable, Fisher's exact test was used to test the relationship between these variables. The level of significance for tests of the association was set at a p-value of less than 0.05. Cross tabulation using Chi-square was also used to determine the association between knowledge and attitude, knowledge and practice, attitude, and practice. Binary logistic regression was done to determine independent factors associated with attitude.

## Results

### *Sociodemographic characteristics*

Four hundred and three healthcare workers participated in this study. The age range of participants was 19 years to 64 years, with a mean age of 36.69 ±

9.53 years. The most represented age group were those aged 31 to 40 years who made up 37.97% (n = 153) of the study group. There were 184 male participants (45.66%), with the ratio of male to female respondents being 0.8:1. Two hundred and sixty participants (64.52%) had partners. The four major professions were doctors 182 (45.16%), pharmacists 93 (23.08%), nurses 60 (14.89%), and laboratory scientists 49 (12.16%) (Table 1).

### *Knowledge of COVID-19*

Three hundred and fifty-seven (88.59%) the participants had good knowledge of COVID-19. The differences in the knowledge of COVID-19 for those with partners were statistically significant (p = 0.004). There was also a significant association between profession and knowledge (p < 0.001). There was no significant difference in the levels of knowledge of COVID-19 to the years of experience of the participating healthcare workers (Table 2). Three hundred and ninety-three respondents (97.51%)

**Table 2.** Knowledge of Covid-19 Infection among Healthcare workers.

Variables	Frequency	Knowledge		P-value
		Good (%)	Average (%)	
<b>Age range (years)</b>				
< 20	2	1 (50.00)	1 (50.00)	0.109
20-30	111	94 (84.68)	17 (15.32)	
31-40	153	140 (91.50)	13 (8.50)	
41-50	91	82 (90.11)	9 (9.89)	
51-60	29	27 (93.10)	2 (6.90)	
> 60	2	2 (100.00)	0 (0.00)	
Missing value	15	11 (73.33)	4 (26.67)	
<b>Gender</b>				
Male	184	169 (91.85)	15 (8.15)	0.041 <sup>##</sup>
Female	219	188 (85.84)	31 (14.16)	
<b>Partnership status</b>				
With partner	260	239 (91.92)	21 (8.08)	0.004 <sup>*</sup>
Without partner	143	118 (82.52)	25 (17.48)	
<b>Denomination</b>				
Anglican	106	98 (92.45)	8 (7.55)	0.394
Catholic	208	183 (87.98)	25 (12.02)	
Jehovah witness	4	3 (75.00)	1 (25.00)	
Pentecostal	85	73 (85.88)	12 (14.12)	
<b>Profession</b>				
Lab scientist	49	38 (77.55)	11 (22.45)	< 0.001 <sup>*</sup>
Medical doctor	182	173 (95.05)	9 (4.95)	
Nurse	60	52 (86.67)	8 (13.22)	
Pharmacist	93	83 (89.25)	10 (10.75)	
Others	19	11 (57.89)	8 (42.11)	
<b>Years of experience (years)</b>				
< 5	129	110 (85.27)	19 (14.73)	0.357
5-9	71	64 (90.14)	7 (9.86)	
≥ 10	203	183 (90.15)	20 (9.85)	
<b>Total</b>	<b>403</b>	<b>357 (88.59)</b>	<b>46 (11.41)</b>	

\*significant p-value; # = Fisher's exact value.

correctly answered that the disease is caused by a virus, while 6 (1.49%) felt it was a punishment from God. One respondent each (0.25%) said it was caused by a bacterium, 5G network, genetically modified, or from an unknown source. Sources of information on COVID-19 for three hundred and ninety-four (97.77%) participants were internet, social media, and other electronic media. Five (1.24%) participants derived their information on COVID-19 from lectures and print media, while the remaining 4 (0.99%) HCWs were informed by friends and neighbours.

*Attitude to COVID-19*

Generally, attitude to work in the COVID-19 era was either poor (n = 101, 25.06%), or indifferent (n = 233, 57.82%). More females (n = 62, 28.31%) had poor attitude compared to the males (n = 39, 21.20%), and these observed differences in attitude to work across both genders were statistically significant (p = 0.007). Profession significantly influenced attitude (p = 0.009). Age, partnership status, tribe, denomination, and years

of experience had no significant association with the attitude of the health workers to work (Table 3).

*Practices to COVID-19*

Three hundred and twenty-eight HCWs (81.39%) had a high level of practice towards preventing COVID-19 infection. However, the differences in the levels at which the health workers practiced preventive measures were not statistically significant to age, sex, partnership status, denomination, profession, and years of experience (Table 4). There was a significant relationship between the level of knowledge and practices of healthcare workers (p = 0.029). Knowledge did not have any relationship with attitude (p = 0.477) nor attitude with practice (p = 0.132) (Table 5).

*Fears and Impact of COVID 19*

One hundred and ninety-six (48.64%) HCWs stated that they had been negatively affected by the pandemic, while 98/403 (24.32%) had been affected both positively and negatively.

**Table 3.** Healthcare workers’ Attitude to work during the Covid-19 pandemic.

Variables	Frequency	attitude			P-value
		Poor	Positive	Indifferent	
<b>Age range (years)</b>					
< 20	2	0 (0.00)	0 (0.00)	2 (100.00)	0.056
20-30	111	32 (28.83)	16 (14.41)	63 (56.76)	
31-40	153	45 (29.41)	23 (15.09)	85 (55.56)	
41-50	91	17 (18.68)	14 (15.38)	60 (65.93)	
51-60	29	5 (17.24)	8 (27.59)	16 (55.17)	
> 60	2	0 (0.00)	1 (50.00)	1 (50.00)	
Missing value	15	2 (13.33)	7 (46.67)	6 (40.00)	
<b>Gender</b>					
Male	184	39 (21.20)	43 (23.37)	102 (55.43)	0.007*
Female	219	62 (28.31)	26 (11.87)	131 (59.82)	
<b>Partnership status</b>					
With partner	260	67 (25.77)	47 (18.08)	146 (56.15)	0.642
Without partner	143	34 (23.78)	22 (15.38)	87 (60.84)	
<b>Denomination</b>					
Anglican	106	30 (28.30)	20 (18.87)	56 (52.83)	0.943
Catholic	208	50 (24.04)	34 (16.35)	124 (59.69)	
Jehovah witness	4	1 (25.00)	1 (25.00)	2 (50.00)	
Pentecostal	85	20 (23.53)	14 (16.47)	51 (60.00)	
<b>Profession</b>					
Lab scientist	49	10 (20.41)	10 (20.41)	29 (59.18)	0.009*
Medical doctor	182	54 (29.67)	29 (15.93)	99 (59.40)	
Nurse	60	10 (16.67)	6 (10.00)	44 (73.33)	
Pharmacist	93	17 (18.28)	22 (23.66)	54 (58.06)	
Others	19	10 (52.63)	2 (10.53)	7 (36.84)	
<b>Years of experience (years)</b>					
< 5	129	36 (27.91)	22 (17.05)	71 (55.04)	0.916
5-9	71	16 (22.54)	12 (16.90)	43 (60.56)	
≥ 10	203	49 (24.14)	35 (17.24)	119 (58.62)	
<b>Total</b>	<b>403</b>	<b>101 (25.06)</b>	<b>69 (17.12)</b>	<b>233 (57.82)</b>	

\*= significant p-value.

**Table 4.** Healthcare workers' use of Preventive Practices.

Variables	Frequency	practice		P-value
		High	Moderate	
<b>Age range (years)</b>				
< 20	2	2 (100.00)	0 (0.00)	0.179
20-30	111	87 (78.38)	24 (21.62)	
31-40	153	129 (84.31)	24 (15.69)	
41-50	91	73 (80.22)	18 (19.78)	
51-60	29	20 (68.97)	9 (31.03)	
> 60	2	2 (100.00)	0 (0.00)	
Missing value	15	15 (100.00)	0 (0.00)	
<b>Gender</b>				
Male	184	148 (80.43)	36 (19.57)	0.652
Female	219	180 (82.19)	39 (17.81)	
<b>Partnership status</b>				
With partner	260	212 (81.54)	48 (18.46)	0.918
Without partner	143	116 (81.12)	27 (18.88)	
<b>Denomination</b>				
Anglican	106	90 (84.91)	16 (15.09)	0.454
Catholic	208	168 (80.77)	40 (19.23)	
Jehovah witness	4	4 (100.00)	0 (0.00)	
Pentecostal	85	66 (77.65)	19 (22.35)	
<b>Profession</b>				
Lab scientist	49	37 (75.51)	12 (24.49)	0.434
Medical doctor	182	151 (82.97)	31 (17.03)	
Nurse	60	50 (83.33)	10 (16.67)	
Pharmacist	93	77 (82.80)	16 (17.20)	
Others	19	13 (68.42)	6 (31.58)	
<b>Years of experience (years)</b>				
< 5	129	103 (79.84)	26 (20.16)	0.365
5-9	71	62 (87.32)	9 (12.68)	
≥ 10	203	163 (80.30)	40 (19.70)	
<b>Total</b>	<b>403</b>	<b>328 (81.39)</b>	<b>75 (18.61)</b>	

**Table 5.** Relationship between Attitude, Knowledge and Preventive practices.

Variables	Frequency	Level of preventive practice		P-value	
		High (%)	Moderate (%)		
<b>Knowledge</b>				0.029*	
Good	357	296 (82.91)	61 (17.09)		
Average	46	32 (69.57)	14 (30.43)	0.132	
<b>Attitude</b>					
Poor	101	87 (86.14)	14 (13.86)		
Positive	69	51 (73.91)	18 (26.09)		
Indifferent	233	190 (81.55)	43 (18.45)		
Variable	Frequency	Attitude			P-value
<b>Knowledge</b>		<b>Poor (%)</b>	<b>Positive (%)</b>	<b>Indifferent (%)</b>	0.477
Good	357	88 (24.65)	64 (17.93)	205 (57.42)	
Average	46	13 (28.26)	5 (10.87)	28 (60.87)	

\*: significant P – value.

**Table 6.** Relationship between Impact of COVID 19, Fears and Attitude of HCWS.

Variables	Frequency	Attitude			P-value
		Poor (%)	Positive (%)	Indifferent (%)	
<b>Fears</b>					
Dying					
No	200	38 (19.00)	47 (23.50)	115 (57.50)	< 0.001*
Yes	201	63 (31.34)	22 (10.95)	116 (57.71)	
Missing value	2	0 (0.00)	0 (0.00)	2 (100.00)	
<b>Death of loved ones</b>					
No	111	19 (17.12)	25 (20.52)	67 (60.36)	0.066
Yes	290	82 (28.28)	44 (15.17)	164 (56.55)	
Missing value	2	0 (0.00)	0 (0.00)	2 (100.00)	
<b>End of the world</b>					
No	330	69 (20.91)	61 (18.48)	200 (60.61)	< 0.001*
Yes	71	32 (45.07)	8 (11.27)	31 (43.66)	
Missing value	2	0 (0.00)	0 (0.00)	2 (100.00)	
<b>Impact</b>					
Lack of sustenance					
No	138	22 (15.94)	31 (22.46)	85 (61.59)	0.007**
Yes	263	79 (30.04)	38 (14.45)	146 (55.51)	
Missing value	2	0 (0.00)	0 (0.00)	2 (100.00)	
<b>Avoiding common places</b>					
No	59	4 (6.78)	21 (35.59)	34 (57.63)	< 0.001*
Yes	342	95 (28.07)	59 (14.04)	214 (57.89)	
Missing value	2	0 (0.00)	0 (0.00)	2 (100.00)	
<b>Lack of ppe</b>					
No	47	6 (12.77)	16 (34.04)	25 (55.19)	0.002*
Yes	354	94 (26.55)	53 (14.97)	207 (58.47)	
Missing value	2	1 (50.00)	0 (0.00)	1 (50.00)	
<b>High cost of commodities</b>					
No	33	5 (15.15)	10 (30.30)	18 (54.55)	0.165
Yes	368	95 (25.82)	59 (16.03)	213 (58.15)	
Missing value	2	1 (50.00)	0 (0.00)	1 (50.00)	
<b>Total</b>	<b>403</b>	<b>101 (25.06)</b>	<b>69 (17.12)</b>	<b>233 (57.82)</b>	

\*: significant p- value; #: Fisher's exact value; HCWs: Healthcare workers; PPE: Personal Protective Equipment.

**Table 7.** Adjusted Odds Ratio for Fears and Impact of COVID-19 by Attitude.

Variable	OR	OR CI	P-value
<b>Fear of death</b>			
Yes	2.045	1.062 – 3.937	0.032*
No (R)	1		
<b>End of the world</b>			
Yes	0.877	0.374-2.056	0.763
No (R)	1		
<b>Avoiding common places</b>			
Yes	2.327	1.141 – 4.744	0.020*
No (R)	1		
<b>Lack of sustenance</b>			
Yes	0.843	0.458 – 1.548	0.581
No (R)	1		
<b>Lack of PPE</b>			
Yes	2.600	1.225 – 5.519	0.013*
No (R)	1		

OR: Odds Ratio, CI: Confidence Interval, R: Reference category, \*: significant P- value.

Almost half of the participants were afraid of dying (49.88%) and this was significantly associated with their attitude to work ( $p < 0.001$ ). Seventy-one (17.62%) HCWs were afraid it was the end of the world and this significantly influenced their attitude to work ( $p < 0.001$ ). Lack of sustenance was a concern to 263/403(65.26%) HCWs and also had a significant impact on their attitude to work ( $p = 0.007$ ). Avoiding common places was another significant impact of COVID-19 on respondents ( $p < 0.001$ ). Also, the lack of PPE had a significant impact on the attitude of HCWs ( $p = 0.002$ ). This is as shown in table 6. After logistic regression, independent factors significantly affecting the attitude of HCWs included fear of death ( $p = 0.032$ ), lack of PPE ( $p = 0.013$ ), and avoidance of common places ( $p = 0.020$ ) (Table 7).

## Discussion

Our findings showed that the majority of health care workers had good knowledge (88.59%) and a high level of use of preventive practices (81.39%). In contrast, poor attitude (25.06%) and an attitude of indifference to work (57.82%) appeared to be the norm during this pandemic. Good knowledge noted among health care workers in this study has also been reported in some other parts of the world. Giao *et al.* [26] in Vietnam reported good knowledge of COVID-19 among HCWs similar to finding by Saqlain *et al.* [24] in Pakistan. A possible explanation could be that the coronavirus pandemic is being widely talked about in the world and information about it is disseminated on various media daily. This is also evident in the multiple sources of information on COVID-19 among HCWs in our study. Most participants (> 90%) derived their information from the internet and social media. In contrast to our findings, Bhagavathula *et al.* [22] reported poor knowledge among health care workers. Medical doctors, nurses, and pharmacists demonstrated a significantly higher level of knowledge when compared to lab scientists and other health care workers. This has also been documented in previous studies [22]. Doctors, pharmacists, and nurses are close contacts of patients and as such may scout for the right information through available media to prevent infection. Males had significantly more knowledge than females in this study. No clear explanation can be given for this. This is in contrast with the report by Olum *et al.* [28] in Uganda who observed no gender difference in the level of knowledge. Further studies may be needed to explore the reasons for this finding. Participants with partners had significantly more knowledge than single participants probably because people with partners are

likely to be more concerned about their health as they affect those of their family members, hence seek information that will enhance their overall protection. Another study with a different design may be needed to explore this finding further. Knowledge was not influenced by the number of years of experience of the HCW. This disagrees with the finding by Nour *et al.* [33] who reported higher knowledge among HCWs who had practiced for more than 10 years. The study by Nour *et al.* [33] however was during the Middle East Respiratory Syndrome/Coronavirus pandemic in the middle east. Good knowledge of any disease will aid in early recognition, diagnosis, treatment, and prevention, more so during the pandemic period.

A high level of adequate practice was noted among respondents. This was similar to findings by Zhou *et al.* [23] in China, Saqlain *et al.* [24] in Pakistan, and Giao *et al.* [26] in Vietnam who observed good practices among health care workers during this COVID-19 pandemic. A significant relationship between knowledge and practice implies that knowledge of all health workers should be improved to enhance the use of preventive practices. When health care workers observe good practices such as wearing face masks always and washing hands frequently with soap and water among others, it will go a long way in ensuring the safety of HCWs and communities, through reduction of transmission of disease among this group of people who may inadvertently spread the disease to their various communities.

Most participants in this survey had either poor or an indifferent attitude towards work during this COVID-19 pandemic. The poor attitude was significantly influenced by various fears and perceived impact of the disease on the HCW. Almost half of the participants felt the pandemic had affected them negatively. This may be evident in the different fears and impact of the disease disclosed by participants. Respondents who were afraid of death were twice more likely to have a poor attitude compared to other respondents (OR = 2.045, 95% CI; 1.062-3.937). Similarly, those who avoided common places they usually went to before the pandemic were twice as likely to have a poor attitude, compared to their counterparts who did not (OR = 2.327, 95% CI; 1.141-4.744). This could be related to uncertainties about the disease, especially with its evolving nature. There is a need for further studies on anxiety and the psychological impact of COVID-19 among HCWs. Lack of Personal Protective Equipment for healthcare workers contributed more than 2.5 times (OR = 2.600, 95% CI; 1.225 – 5.519) to the poor attitude of workers.

Morbidity and mortality among HCWs have been increasing during this pandemic [16]. The provision of PPE is necessary to protect HCWs who are key in this battle against COVID-19 infection. This in turn may motivate them and improve their attitude to work. In contrast, however, a positive attitude was reported among Vietnamese health care workers by Giao *et al.* [26]. We also noted that more females (28.31%) exhibited significantly poor attitude to work when compared to their male colleagues {(21.20%),  $p = 0.007$ }. The reason for this significant difference is unclear. It may be related to fear and anxiety which reflects on the attitude. Our study did not observe any significant relationship between the level of knowledge and attitude, or knowledge and level of practice. This was, in contrast, to report by some other authors who had found a correlation between the level of knowledge and attitude [24]. To the best of our knowledge, this is one of the early studies on COVID 19 among Nigerian healthcare workers.

## Conclusions

Our findings showed that despite the good level of knowledge that influenced practice, and the high use of preventive practices among health care workers, there was a significantly poor and indifferent attitude to work among HCWs in South-Eastern, Nigeria. Profession influenced knowledge and practice. The attitude was strongly related to fear of death, avoidance of commonplaces, and lack of personal protective equipment. Female HCWs had a significantly poorer attitude to work when compared with males. It is thus necessary to conduct routine training to improve knowledge among all HCWs so that good practices will be strengthened and enhanced. PPE should be provided and strategies to address fears to improve attitude to work during this COVID-19 pandemic should be employed.

Limitations: Our survey was web-based, and so tracking refusals, losses, and studying health professionals who did not have mobile phones or internet access was difficult.

## Authors' contributions

The manuscript was conceived by MCNP and MII. All the authors contributed to the study design. Data collection was done by all the authors, while data analysis was done by MCNP, ACM, MII, and NCP. The initial draft was produced by MCNP, ACM, MII, EHO, EAY; and edited by NCI, OSK, UIB, UU, OUC, OE. All authors agree with the final edited manuscript.

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