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Symptomatology, Positivity, and Type of Care Received by Healthcare Workers Tested for COVID-19 Infection in a North-Central State in Nigeria: A Retrospective Study

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Abstract

Background: The health of healthcare workers (HCWs) is an indicator of the quality of health service provision during the COVID-19 pandemic.

Objectives: This study aimed to describe the symptomatology and positivity of COVID-19 infection and the type of COVID-19 care received among HCWs in a North-Central State in Nigeria.

Methods: This was a retrospective review of HCWs tested for COVID-19 as retrieved from the Surveillance Outbreak Response Management System between April 2020 and March 2021 in Kwara State, Nigeria.

Results: Among the 1453 HCWs, 831 (57.2%) were above 35 years, and 874 (60.2%) were females. Among the 259 HCWs who tested positive for COVID-19, 122 (23.8%) lived in urban areas ($\chi^2=13.94$, $P\leq0.001$). Also, 83 (30.7%) of symptomatic persons tested positive for COVID-19 ($\chi^2=37.766$, $P\leq0.001$). Overall, 33 (12.7%) of the 259 positive HCWs received hospital-based COVID-19 care, and 33 (16.1%) who had less than 2 symptoms received hospital-based COVID-19 care ($\chi^2=9.962$, $P=0.002$). HCWs who had cough had three times odds of testing positive for COVID-19 (OR=3.299, 95% CI=1.571–6.927, $P=0.002$). Also, HCWs who manifested loss of taste had three times odds of testing positive for COVID-19 (OR=3.392, 95% CI=1.010–11.393, $P=0.048$).

Conclusion: COVID-19 testing should be encouraged among HCWs, especially those with cough symptoms and loss of taste.

Keywords: COVID-19, Health Workers, Home Care, Symptoms, Nigeria

1. Background

The novel Coronavirus disease (COVID-19) is a respiratory illness characterized by mild symptoms, such as fever and cough, and severe symptoms, such as respiratory distress.[1,2] COVID-19 was declared a pandemic by the World Health Organization (WHO) after being transmitted across more than 100 000 individuals globally.[3,4] As of October 8, 2021, COVID-19 had spread across more than 200 countries, with nearly 238 021 172 cases and 4 857 748 deaths recorded globally.[5] The index case of COVID-19 in Africa was reported in Egypt on 14th February, 2020.[6] Shortly afterward, Nigeria recorded an index case of COVID-19 on the 27th February, 2020.[7] Between this period and October 8, 2021, 207 479 COVID-19 cases and 2743 COVID-19-related deaths have been reported in Nigeria.[5] Evidence from literature has shown that some individuals, including healthcare workers (HCWs), are more vulnerable to COVID-19 than the general population.[4]

HCWs are trained professionals concerned with the management of ill conditions.[4] The health of HCWs is an indicator of the quality of health service provision during the COVID-19 pandemic.[8] When infected, HCWs could become vectors for the onward transmission of COVID-19, thus placing other persons at risk for COVID-19.[9] The rate of COVID-19 transmission rates among HCWs has been estimated at 6% globally and 3% in Nigeria.[10,11] The likelihood of an increase in COVID-19 infection rate among HCWs stems primarily from the asymptomatic nature of COVID-19 among a large proportion of infected persons, thereby causing spread among peers unknowingly.[12] Furthermore, HCWs could also get infected with COVID-19 while providing care to COVID-19 positive patients.

Two modes of COVID-19 care have been described, namely hospital-based care and home-based care (HBC).[13,14] COVID-19 HBC refers to the provision of care to positive COVID-19 cases in designated health facilities, such as infectious disease units of health facilities.[14,15] HBC in the COVID-19 context has been defined as any form of care provided to positive COVID-19 cases from the comfort

of their homes following HCWs' recommendations.[13] HBC helps to decongest health facilities, thereby reducing the nosocomial transmission of COVID-19.[16] HBC has been recommended by the World Health Organization and has been adopted for use by local health organizations, including the Nigeria Centre for Disease Control for asymptomatic or mildly symptomatic positive COVID-19 cases.[13,16]

To the best of our knowledge, no publicly available literature describes the COVID-19 positivity rate among HCWs in Nigeria. It is unknown if the pattern of COVID-19 symptomatology among HCWs is different from that reported in literature among the general population. In addition, there exists limited knowledge on the type of COVID-19 care, hospital or home-based, adopted among HCWs. Suppose these gaps in the literature are addressed. In that case, the strategies required to protect HCWs amid the COVID-19 pandemic can be improved upon to improve HCWs' resilience while providing quality healthcare in Nigeria amid the COVID-19 pandemic. Furthermore, given the resource-limited nature of Nigeria, knowledge obtained on the type of COVID-19 care received among HCWs could be used to promote healthcare capacity in responding to the COVID-19 pandemic.

2. Objectives

This study aimed to describe the symptomatology and positivity of COVID-19 infection and the type of COVID-19 care received among HCWs in a North-Central State in Nigeria.

3. Methods

3.1. Study Design

This study was a retrospective review of records of HCWs who had enrolled for the COVID-19 test in Kwara State, Nigeria

3.2. Study Area

Kwara State is one of the States in North-Central Nigeria. The administrative headquarters of Kwara State is in Ilorin, the State capital. The boundaries of Kwara State include Ekiti, Osun, and the Oyo States to the North, the Republic of Benin to the West, and Kogi State to the East.[17] Kwara State reported her index case of COVID-19 on April 2, 2020. As of April 22, 2021, Kwara State had reported 3120 cases and 251 deaths, thus ranking 11th on the COVID-19 case reports in Nigeria.[18] There are 561 government-owned health facilities and more than 515 private health facilities with nearly 3000 HCWs in Kwara State.[19]

3.3. Study Population

The study was conducted among HCWs tested for COVID-19 in Kwara State, Nigeria

3.4. Data Collection

The data were retrieved from the Surveillance Outbreak Response Management System (SORMAS), Kwara State, between April 2020, when Kwara recorded her index case of COVID-19, and March 2021. The data retrieved were included: age, presence or absence of symptoms, specific manifestations of symptoms, date of COVID-19 test, the outcome of COVID-19 tests, presence or absence of comorbidity, and specific comorbidity present.

3.5. Data Management

Data were input into the Statistical Software for the Social Sciences version 25.0. Data cleaning and sorting were done thereafter. Descriptive analysis of sociodemographic characteristics of HCWs such as age, sex, level of education, and residential area was computed using frequencies and percentages. Other HCWs' characteristics such as symptomatology and comorbidity were also computed using frequencies and percentages. HCWs who had only one COVID-19 symptom were categorized to have "less than two symptoms", while those with more than one symptom were said to have "two or more symptoms".

Bivariate analysis was conducted to determine the association between HCWs' sociodemographic and clinical characteristics and type of COVID-19 care received among COVID-19 positive HCWs. Bivariate analysis was also conducted to determine the association between HCWs' sociodemographic and clinical characteristics and the outcome of COVID-19 tests. Further, bivariate analysis was conducted to determine the association between COVID-19 symptoms and the outcome of COVID-19 tests among COVID-19 positive HCWs. To determine the factors associated with positive COVID-19 tests among HCWs. The binary logistic regression tests were conducted on variables that were significant in the association between respondents' clinical characteristics and the outcome of COVID-19 tests. All the variables were pooled into the logistic regression model; therefore, they all adjusted for. The level of statistical significance was set at $P < 0.05$.

4. Results

4.1. Characteristics of Healthcare Workers Who Participated in the Study

Among the 1453 HCWs, 831 (57.2%) were above 35 years, 874 (60.2%) were females, 1,010 (69.5%) had attained tertiary education, and 512 (85.9%) lived in urban areas. Also, 205 (79.2%) manifested less than 2 COVID-19 symptoms, 11 (4.2%) had comorbidity, and 10 (90.9%) among them had only one comorbidity. One death was reported among individuals who presented with COVID-19 symptoms.

4.2. Association Between Healthcare Workers' Characteristics and Outcome of COVID-19 Tests

Among the HCWs who tested positive for COVID-19, 122 (23.8%) lived in urban areas compared to 11 (13.1%) who lived in rural areas ($\chi^2 = 13.94$, $P \leq 0.001$). Also, 83 (30.7%) symptomatic persons tested positive for COVID-19 compared to 176 (14.9%) asymptomatic persons ($\chi^2 = 37.766$, $P \leq 0.001$). In addition, 54 (39.1%)

HCWs who manifested 2 or more COVID-19 symptoms tested positive for COVID-19 compared to 205 (15.6%) with fewer symptoms ($\chi^2 = 4.252$, $P \leq 0.001$) (Table 1).

4.3. Association Between Healthcare Workers' Characteristics and Type of COVID-19 Care Received

Overall, 33 (12.7%) of the 259 positive HCWs received hospital-based COVID-19 care, while 226 (87.3%) received HBC for COVID-19. Table 2 shows the association between patient characteristics and type of COVID-19 care received among COVID-19 positive HCWs. Among them, 28 (18.2%) females received HBC compared to 5 (4.8%) males ($\chi^2 = 10.113$, $P = 0.001$). Also, 33 (18.8%) symptomatic persons received HBC compared to 83 (100.0%) asymptomatic persons who received home-based care ($\chi^2 = 17.835$, $P \leq 0.001$). Further, 33 (16.1%) of HCWs with fewer than 2 symptoms had received COVID-19 HBC compared to 54 (100.0%) with 2 or more symptoms who received COVID-19 HBC ($\chi^2 = 9.962$, $P = 0.002$).

4.4. Description of COVID-19 Epidemic Curve Among Healthcare Workers

From Figure 1, there was a peak in COVID-19 positivity among COVID-19 positive HCWs between May and July 2020. The initial peak period was followed by a decline in COVID-19 positivity between August and November 2020. However, a latter peak period of COVID-19 positivity began in December 2020 and was sustained till February 2021 but declined in March 2021.

4.5. Association Between COVID-19 Symptoms and Outcome of COVID-19 Tests Among Healthcare Workers

Table 3 shows the association between COVID-19 symptoms manifested by HCWs and the outcome of COVID-19 tests. Among them, 251 (17.6%) among the 1430 (98.4) persons who had chest pain tested positive for COVID-19 compared to 8 (34.8%) among the 23 (1.6%) who did not have chest pain and tested positive for COVID-19 ($\chi^2 = 4.588$, $P = 0.032$). Also, 45 (42.9%) of the 105 (7.2%) persons who had cough tested positive for COVID-19 compared to 214 (15.9%) of the 1348 (92.8%) who had no cough and tested positive for COVID-19 ($\chi^2 = 48.415$, $P \leq 0.001$).

4.6. Determinants of Positive COVID-19 Test Outcome Among Healthcare Workers

From Table 4, HCWs who manifested cough had three times the odds of testing positive for COVID-19 compared to those who had no cough (AOR = 3.299, 95% CI = 1.571–6.927, $P = 0.002$). Also, HCWs who manifested loss of taste had three times the odds of testing positive for COVID-19 compared to those who had no loss of taste (AOR = 3.392, 95% CI = 1.010–11.393, $P = 0.048$). Finally, HCWs who lived in urban areas had two times the odds of testing

Table 1. Characteristics and Outcome of COVID-19 Tests Among Healthcare workers in a North-Central State in Nigeria

	Outcome		Total	χ^2	*P* Value
	Positive	Negative			
	No. (%)	No. (%)	No. (%)		
Age group (y)					
≤35	103 (16.7)	519 (83.3)	622 (42.8)	1.071	0.301
>35	156 (18.8)	675 (81.2)	831 (57.2)		
Gender					
Male	105 (18.1)	474 (81.9)	579 (39.8)	0.063	0.802
Female	154 (17.6)	720 (82.4)	874 (60.2)		
Level of education					
Tertiary	104 (23.5)	339 (65.4)	1010 (69.5)	13.894	**<0.001**
Below tertiary	155 (15.3)	855 (84.7)	443 (30.5)		
Residential area					
Rural	11 (13.1)	73 (86.9)	84 (14.1)	19.584	**<0.001**
Urban	122 (23.8)	390 (76.2)	512 (85.9)		
Symptomatic					
Yes	83 (30.7)	187 (69.3)	1183 (81.4)	37.766	**<0.001**
No	176 (14.9)	1007 (85.1)	270 (18.6)		
Number of COVID-19 symptoms					
<2	205 (15.6)	1110 (84.4)	1315 (90.5)	47.252	**<0.001**
≥2	54 (39.1)	84 (60.9)	138 (9.5)		
Presence of comorbidity					
Yes	251 (17.6)	1117 (82.4)	1429 (98.3)	3.489	0.062
No	8 (32.0)	17 (68.0)	25 (1.7)		

Table 2. Characteristics and Type of COVID-19 Care Received Among COVID-19 Positive Healthcare Workers in a North-Central State in Nigeria

	Type of COVID-19 Care		Total	χ^2	*P* Value
	Hospital	Home			
	No. (%)	No. (%)	No. (%)		
Age group (y)					
≤35	14 (13.6)	89 (86.4)	103 (39.8)	0.111	0.739
>35	19 (12.2)	137 (87.8)	156 (80.2)		
Gender					
Male	5 (4.8)	100 (95.2)	105 (40.5)	10.113	**0.001**
Female	28 (18.2)	126 (81.8)	154 (59.5)		
Level of education					
Tertiary	33 (21.3)	122 (78.7)	155 (59.8)	25.375	**<0.001**
Below Tertiary	0 (0.0)	104 (100.0)	104 (40.2)		
Residential area					
Rural	0 (0.0)	11 (100.0)	11 (8.3)	0.091	0.763
Urban	1 (0.8)	121 (99.2)	122 (91.7)		
Symptomatic					
Yes	33 (18.8)	143 (81.3)	176 (68.0)	17.835	**<0.001**
No	0 (0.0)	83 (100.0)	83 (32.0)		
Number of symptoms					
<2	33 (16.1)	172 (83.9)	205 (79.2)	9.962	**0.002**
≥2	0 (0.0)	54 (100.0)	54 (20.8)		
Presence of comorbidity					
Yes	0 (0.0)	8 (100.0)	8 (3.1)	1.205	0.272
No	33 (13.1)	218 (86.9)	251 (96.9)		

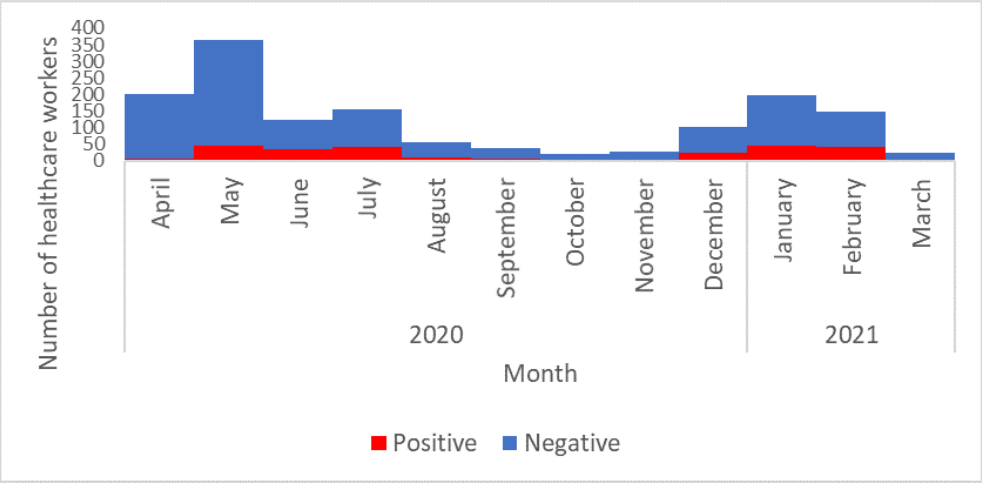

Figure 1. COVID-19 Positivity Among Healthcare Workers in a North-Central State in Nigeria.

positive for COVID-19 compared to their counterparts who lived in rural areas (AOR = 2.051, 95% CI = 0.571–4.138, *P* = 0.045).

5. Discussion

Findings from this study revealed that 32% of HCWs who tested positive for COVID-19 were asymptomatic. This is like the findings of a research conducted among HCWs in Iran which reported that 35% of COVID-19 positive HCWs were asymptomatic.[8] The findings in the present study provide evidence on the asymptomatic nature of COVID-19 among one of every three HCWs. This significant proportion confirms current knowledge that asymptomatic COVID-19 cases are potential sources of COVID-19 infection and could promote community transmission of COVID-19.[20] This result implies that the suspicion index for COVID-19 should be improved upon, especially among HCWs. Using the Health Belief Model, an increased index of suspicion among HCWs will influence the adoption of recommended COVID-19 safety

Table 3. Association Between COVID-19 Symptoms and Outcome of COVID-19 Tests Among Healthcare Workers in a North-Central State in Nigeria

COVID-19 Symptoms	Outcome		Total	χ^2	*P* Value
	Positive	Negative			
	No. (%)	No. (%)	No. (%)		
Chest pain					
Yes	251 (17.6)	1179 (82.4)	1430 (98.4)	4.588	**0.032**
No	8 (34.8)	15 (65.2)	23 (1.6)		
Chills (sweat)					
Yes	1 (25.0)	3 (75.0)	4 (0.3)	0.141	0.707
No	258 (17.8)	1191 (82.2)	1449 (99.7)		
Cough					
Yes	45 (42.9)	60 (57.1)	105 (7.2)	48.415	**<0.001**
No	214 (15.9)	1134 (84.1)	1348 (92.8)		
Diarrhea					
Yes	8 (25.8)	23 (74.2)	31 (2.1))	1.378	0.241
No	251 (17.7)	1171 (82.3)	1422 (97.9		
Difficulty breathing (dyspnea)					
Yes	8 (50.0)	8 (50.0)	16 (1.1)	11.434	**0.001**
No	251 (17.5)	1186 (82.5)	1437 (98.9		
Fatigue					
Yes	12 (52.2)	11 (47.8)	23 (1.6)	18.824	**<0.001**
No	247 (17.3)	1183 (82.7)	1430 (98.4		
Fever					
Yes	20 (30.7)	46 (69.3)	66 (4.5)	7.349	**0.007**
No	239 (17.2)	1148 (82.8)	1387 (95.5)		
Headache					
Yes	23 (34.3)	44 (65.7)	67 (4.6)	13.060	**<0.001**
No	236 (17.0)	1150 (83.0)	1386 (95.4)		
Joint pain (arthritis)					
Yes	1 (50.0)	1 (50.0)	2 (0.1) 9)	1.415	0.234
No	258 (17.8)	1193 (82.2)	1451 (99.		
Sore throat					
Yes	29 (35.4)	53 (64.6)	82 (5.6))	18.254	**<0.001**
No	230 (16.8)	1141 (83.2)	1371 (94.4		
Muscle pain					
Yes	2 (66.7)	1 (33.3)	3 (0.2)	4.896	**0.027**
No	257 (17.7)	1193 (82.3)	1450 (99.8		
Nausea					
Yes	6 (28.6)	15 (71.4)	21 (1.4)	1.680	0.195
No	253 (17.7)	1179 (82.3)	1432 (98.6)		
Vomiting					
Yes	2 (16.7)	10 (83.3)	12 (0.8))	0.011	0.916
No	257 (17.8)	1184 (82.2)	1441 (99.2		
Loss of taste					
Yes	15 (60.0)	10 (40.0)	25 (1.7)	30.889	**<0.001**
No	244 (17.1)	1184 (82.9)	1428 (98.3)		
Loss of smell					
Yes	8 (61.5)	5 (38.5)	13 (0.9)	17.112	**<0.001**
No	251 (17.4)	1189 (82.6)	1440 (99.1)		

Table 4. Determinants of Positive COVID-19 Tests Outcome Among Healthcare Workers in a North-Central State in Nigeria

Variables	Adjusted Odds Ratio	95% CI for Adjusted Odds Ratio		*P* Value
		Lower	Upper	
Chest pain	0.57	0.178	1.825	0.344
Cough	3.299	1.571	6.927	**0.002**
Breathing difficulties (Dyspnea)	0.658	0.111	3.892	0.644
Fatigue	1.405	0.407	4.855	0.591
Fever	0.828	0.342	2.002	0.675
Headache	0.744	0.322	1.718	0.488
Sore throat	0.975	0.415	2.291	0.953
Muscle pain	4.798	0.301	76.363	0.267
Loss of taste	3.392	1.010	11.393	**0.048**
Loss of smell	0.695	0.123	3.929	0.681
Tertiary education	1.31	0.841	2.04	0.232
Urban residential area	2.051	1.017	4.138	**0.045**
Symptomatic	1.049	0.526	2.093	0.892
≥2 Symptoms	1.439	0.571	3.628	0.44

measures such as the use of face masks both in hospital and community settings.[21]

This study found that the top leading symptoms of COVID-19 among COVID-19 positive cases included loss of taste, loss of smell, cough, difficulty breathing, and fatigue. These reflect that COVID-19 is a respiratory illness that could mimic illnesses such as malaria in symptoms.[22] Other studies have reported cough, breathing difficulties, and loss of taste as the symptoms presented among a large proportion of COVID-19 cases.[23] The symptoms reported in this study are included in the array of COVID-19 symptoms suggested by the WHO.[24] Our study found that positive COVID-19 tests were determined by the manifestation of symptoms such as cough and loss of taste ($P=0.002$). Therefore, this finding highlights the need to improve COVID-19 testing capacity so that individuals who present with cough and loss of taste could be diagnosed early. Early diagnosis will help rule out confounders and enhance the implementation of evidence-based strategies to manage confirmed COVID-19 cases.

Findings from this study identified residence in an urban location as a predictor of positive COVID-19 tests among HCWs. This finding is, however, not limited to HCWs only. Urban areas are the hubs of commercialization, industrialization, and globalization in any given country. Urban communities are therefore characterized by significant population and overcrowding, reported as risk factors for COVID-19.[25] Due to the repeated exposure to these risk factors, individuals who reside in urban areas are more likely to develop COVID-19 symptoms and test positive for COVID-19. This finding, therefore, suggests that despite the benefits such as improved quality of life associated with urban settings, the prevalence of infectious diseases, such as COVID-19, are commoner in such settings. Therefore, COVID-19 campaigns should be intensified significantly in urban settings.

The likelihood to disregard COVID-19 safety protocols is higher in urban settings and could increase the risk of transmission of COVID-19 among many.[26] Consequently, adherence to COVID-19 safety protocols, such as social distancing and use of face masks, should be promoted through many strategies, such as the use of enforcement officers in public. For hospital settings, the COVID-19 task force needs to be instituted with its members stationed in each department in the health facilities. Such focal persons will be backed by the hospital management team and enforce compliance to the use of face masks and regular practice of handwashing among HCWs.

The epidemic curve of COVID-19 among HCWs in Kwara State revealed two waves of positivity during the COVID-19 pandemic. The first COVID-19 wave was recorded between May and July 2020. In July, training sessions were organized for skilled and unskilled HCWs, including community pharmacists and patent medicine vendors in Kwara State.[27,28] The training helped improve community awareness of COVID-19, debunk fallacies and myths, and promote behavioral change towards using face masks, regular hand hygiene, and other COVID-19 safety protocols. In addition, the activities of the Community Health Volunteers employed by the Africa Center for Disease Prevention and Control were scaled up during this period.[29] Also, effective community engagement on COVID-19 prevention was intensified. The results of these activities contributed to the decline in cases between August and November 2020.

In December 2020, however, the second wave of positivity commenced. During the festive period, many individuals threw caution to the wind, and shunned the COVID-19 safety protocols. Therefore, such negligence among HCWs and community members contributed to a sustained peak in COVID-19 positivity between December 2020 and February 2021. In March 2021, the COVAX vaccine was flagged off and administered to HCWs in Kwara and other states across Nigeria.[30] The effectiveness of the COVAX vaccine could have contributed to the situation in Kwara State in March 2021, when no positive case of COVID-19 was recorded. Therefore, it is required that delay is not entertained in the procurement of more COVAX vaccines to administer the second dose to HCWs. It is, however, unfortunate that enrolment in COVID-19 testing declined during this period. Keeping HCWs in good health requires that COVID-19 vaccination and testing be promoted simultaneously so that effective management of identified cases can be done.

5.1. Limitations

Limited variables obtained from the SORMAS reduced the exploration of multiple determinants of positive

Research Highlights

What Is Already Known?

Healthcare workers (HCWs) are as vulnerable to COVID-19 as the general population. Therefore, continuous healthcare service provision and improved health of HCWs, enrolment in COVID-19 testing should be encouraged among HCWs.

What Does This Study Add?

First, since more COVID-19 cases were reported among HCWs in urban areas, precedence must be given to adherence to the use of COVID-19 safety measures in health facilities located in urban areas.

COVID-19 test outcomes among HCWs. Despite this limitation, this study provided insight into the trend of COVID-19 positivity and symptomatology among HCWs. Furthermore, this study highlighted that HCWs are early adopters of innovation, given the full-fledged commencement of HBC in the COVID-19 outbreak context.

6. Conclusion

HCWs are as vulnerable to COVID-19 as the general population. To ensure continuous healthcare service provision and improved health. HCWs' enrolment in COVID-19 testing should be encouraged. For this cause, the decentralization of COVID-19 testing centers should be prioritized. To achieve this, the active engagement of members of the health management board is crucial. Since more COVID-19 cases were reported among HCWs in urban areas, precedence must be given to adherence to COVID-19 safety measures in health facilities located in urban areas. To ensure that the COVID-19 pandemic is completely submerged, refresher training needs to be organized regularly for all HCWs. It will update them on recent trends in the pattern of COVID-19 and effectively equip them to take necessary precautionary actions towards self-protection from COVID-19.

Authors' Contributions

OSI, AAA, ODA, and OEF conceptualized the study. OSI, ODA, and OEF supervised data collection. AAA and OSI conducted data analysis. AAA wrote the first draft of the manuscript. All authors revised the manuscript for critical intellectual content and approved the final version of the manuscript.

Conflict of Interest Disclosures

The authors declare no conflict of interest regarding this study.

Ethical Approval

Ethical approval/permission for this study was obtained from the Institutional Review Board of the Nigerian Institute of Medical Research (Reference Number: IRB/20/048) as a part of the COVID-19 research. Confidentiality of data was maintained, and data obtained from the SORMAS were not used for self-motivated purposes.

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