Epidemiology and psychosocial assessment of COVID-19 among workers of the Nigeria Centre for Disease Control infected with COVID-19

Fatima Saleh,[1] David Idowu Olatunji,[1] Ehichioya Ofeimun,[1] Evaezi Okpokoro,[2] Emily Crawford,[1] Mahmood Dalhat,[1] Ehimario Igumbor,[3] Sunday Eziechina,[1] Stella Inweregbu,[1] Chinwe Lucia Ochu,[1] Ihekweazu Chikwe[1]

[1]Nigeria Centre for Disease Control, Abuja, Nigeria; [2]Institute of Human Virology, Abuja, Nigeria; [3]Centre for Infectious Disease Research, Nigerian institute of Medical Research, Lagos, Nigeria

Abstract

Background. COVID-19 is a global health crisis. By 2021, Nigeria had 230,000 cases. As the national public health institute, NCDC leads the COVID-19 response. Due to constant contact with infected patients, agency employees are at high-risk. Here, we describe the transmission and psychosocial effects of COVID-19 among infected NCDC workers as a learning curve for minimizing occupational transmission among frontline public health workers in future outbreaks.

Methods. We approved and enrolled all NCDC COVID-19-infected personnel from November to December 2020. We collected data using SurveyMonkey. STATA 14 analyzed the data.

Results. 172 of 300 afflicted NCDC staff participated in this study. One-third were between 30 and 39; most were male (104, 60.5%). Most participants worked in the lab (30%) or surveillance (24%). Only 19% (33/172) of participants confirmed pandemic deployment. Most reported interaction with a confirmed case (112/65.1%). Most people (78, 45.3%) felt unhappy when diagnosed. Anger, worry, and low motivation also ranked high (19). The majority reported adequate financial, moral, or psychosocial assistance (26, 70.6%).

Conclusions. NCDC staff had a high SARS-CoV-2 infection rate and emotional damage. We urge stricter infection control methods when sending staff for outbreaks response to prevent additional transmission, as well as ongoing psychosocial and economic assistance for afflicted workers.

Correspondence: David Idowu Olatunji, 801 Ebitu Ukiwe Street, Jabi, Abuja, Nigeria.
Tel: +2348107328566.
E-mail: david.olatunji@ncdc.gov.ng

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Introduction

The novel coronavirus disease 2019 (COVID- 19) has rapidly become a major public health crisis, affecting more than 278.6 million individuals, and causing over 5.4 million deaths globally as of December 2021.[1] The Nigeria Centre for Disease Control (NCDC) has reported more than 230,000 cases and 2,900 deaths in Nigeria as of 24 December 2021.[2] The disease also poses an important occupational health risk to healthcare workers (HCWs), as evidenced by high reporting of infection among this group.[3]

In the absence of curative drug for the disease, the use of non-pharmaceutical interventions (NPIs) including mask wearing and physical distancing have been adopted and have shown considerable effectiveness in reducing the impact of the pandemic.[4,5] Regardless, many cases have been reported among the general public as well as among HCWs.

In Nigeria, NCDC is responsible for infectious disease public health response activities through the national Emergency Operation Centre (EOC). During COVID-19 pandemic, the agency staff were involved in laboratory testing of COVID-19 samples, deployed for outbreak investigation amongst other activities. The first confirmed case among NCDC staff was detected on 9th April 2020 and was linked to exposure while deployed for investigation. Subsequently, more workers of the NCDC and partners have reported infection.

The regular surveillance of staff involved in outbreak response is very important as this can reduce the risk of healthcare associated infections and in turn, maintain the confidence of staff.[6] Given the nature of work HCWs engage in, they are faced with a higher risk of infection with many diseases.[7] It has been noted that to survey for emerging infectious diseases, it is crucial to monitor symptoms relating to specific infections among HCWs.[8,9] However, given that a higher percentage of people with COVID- 19 are asymptomatic, there is a risk for HCWs to import the virus, SARS-CoV-2 from contacts in the community to health facilities.[10] With regards to this, study have shown HCWs becoming positive for SARSCoV-2 regardless of adherence to NPI measures within health facility.[6]

Staff from NCDC deployed for rapid response across the states in Nigeria are faced with different challenges including stress

elements associated with insecurity, fatigue due to long working hours, as well as risk of exposure to infection and the attendant isolation or quarantine. Many studies have examine and documented the effect of SARS-CoV-2 on HCWs.[10,11] However, at NCDC no such study has been conducted previously among the agency staff. Here, we characterized transmission and psychosocial effect of SARS CoV-2 infection among NCDC staff as a learning curve on how best to mitigate these while minimising occupational transmission among frontline public health workers in future outbreaks.

Materials and methods

NCDC is the national public health agency of Nigeria. It consists of 3 campuses (2 in Abuja and 1 in Lagos State) and over 300 staff across Nigeria out of which 172 were enrolled for this study

The study population eligible for participation in this study were NCDC staff infected with SARS-CoV-2 in all the agency campuses from November 2020 – December 2020, including veterinary and medical doctors, pharmacists, public health officers, medical laboratory scientists, administrative staff, and others. Staff who tested positive for COVID-19 were enrolled for this study.

We conducted a cross sectional study and enrolled all staff of the NCDC infected with SARS-CoV-2 from November to December 2020. In line with the principle of physical distancing and to prevent further spread of SARS-CoV-2, we deployed an online questionnaire for data collection. Survey monkey was used to develop the questionnaire, which was later delivered to the study participants via email.

Consent and ethical consideration

Oral consent was taken from the participants before joining the study. All information collected were kept strictly confidential by removing identifiers like names that link the collected information to specific individuals. The protocol for this study was approved by the Nigeria National Health Research Ethics Committee (approval number - NHREC/01/01/2007-24/11/2020).

Statistical analysis

The data analysis was done using STATA statistical software package (version 14). Summary statistics was generated. Categorical variables were presented in frequency tables and chart while continuous variables were presented as mean and SD if normally distributed. Where necessary, explanatory variables were recoded or stratified by outcome of interest. Chi sq test for association were used with a significance value of $p<0.05$.

Results

Demographic characteristics of study participants

As shown in Table 1, 172 healthcare workers infected with COVID-19 from Nigeria Centre for Disease Control participated in this study. Most of the respondents belong to the age group 30 – 39 years (51, 29.7%), were males (104, 60.5%), work at the Laboratory Department (52, 30.2%), belong to COVID -19 surveillance unit (51, 29.7%), belong to the grade level 10 and below (141, 95.3%), were full time staff (81, 47.1%), have worked with NCDC from between 6 months to 2 years (85, 49.4%), and had no underlying medical conditions (143, 83.1%). Among those who affirmed to have underlying medical conditions, hypertension (14, 48.28%), was the most reported. Only 33 participants confirmed that they were deployed outside their duty stations during the pandemic (Table 1).

Possible source/location of infection

Of the 172 participants, most suggested use of an ATM (52%) and public transport (43%) as likely source of infection. Despite this, 65% of the respondents had contact with a confirmed case before they were confirmed with COVID-19. In terms of adherence to the COVID-19 protocol, 43% failed to maintain the recommended physical distance of at least 2 meters when dealing with infected persons, while 24% did not use face masks properly (Table 2).

Challenges experienced upon diagnosis

Following diagnosis of COVID-19, delay in transportation to the treatment center was the most common (32, 18.6%) challenge. Notwithstanding this, about 69% revealed that their experience at isolation center was satisfactory, while 5 (5%) respondents were not satisfied (Table 3).

Psychosocial effect of COVID-19 infected staff

As shown in Figure 1, sadness (58%) was the most common psychological expression among our respondents while few were calm and confident (15%). About 22% of the participants experienced some form of stigmatization. The most reported was avoidance from friends and family (37%) (Table 4).

Support received by COVID-19 Infected Staff of the NCDC

Majority (166, 97%) of the respondents received either financial, or moral/social, or psychological support. Among these, 142 (83%) received any two of the support while about 24 (14%) received all three supports. Majority of the participants (62%) responded that the support received from NCDC was adequate and helpful (Table 5).

Discussion

The study characterised the transmission and psychosocial effect of the COVID-19 infection among 172 infected staff of the NCDC. The result suggest that majority of the participants were between the ages of 30 and 39, were males, worked at the laboratory department, confirmed deployment outside their primary duty stations during the pandemic, had contact with a confirmed case, and largely felt sad and stigmatized upon diagnosis with COVID-19.

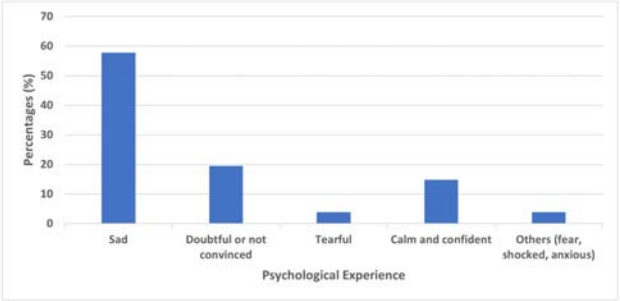

Figure 1. Psychological Responses of COVID-19 Infected Staff at NCDC.

Table 1. Socio-demographic characteristics of NCDC staff who participated in the study.

Socio-demographic variable	Frequency N=172, n (%)	95% CI
Age in years		
20 – 39	51 (29.7)	**22.9 - 37.1**
30 – 39	72 (41.9)	34.4 – 49.6
40 – 49	33 (19.2)	13.2 – 25.9
50 – 59	14 (8.1)	4.5 - 13.2
60+	2 (1.2)	0.1 – 4.1
Gender		
Female	68 (39.5)	32.2 – 47.3
Male	104 (60.5)	52.7 – 67.8
Department		
Administration	17 (9.9)	5.9 – 15.4
Cleaner	5 (2.9)	1.0 – 6.7
DG's office	9 (5.2)	2.4 – 9.7
Driver	1 (0.6)	**0.02 - 3.2**
Finance	2 (1.2)	0.1 - 4.1
HEPR	14 (8.1)	4.5 - 13.2
HR	1 (0.6)	**0.02 - 3.2**
ICT	4 (2.3)	0.6 - 5.9
Laboratory	52 (30.2)	**23.5 - 37.7**
PPKM	23 (13.4)	8.7 – 19.4
REDISSE	2 (1.2)	0.1 - 4.1
Surveillance	42 (24.4)	18.2 – 31.5
COVID-19 EOC units		
AMR	1 (0.6)	**0.02 - 3.2**
Case management	3 (1.7)	0.4 - 5.0
Coordination	14 (8.1)	4.5 - 13.2
IPC/Safety	12 (7.0)	**3.7 - 11.9**
Laboratory	46 (26.7)	20.3 – 34.0
Logistics	17 (9.9)	5.9 - 15.4
Partner liaison	2 (1.2)	0.1 - 4.1
Research	6 (3.5)	1.3 - 7.4
Risk communication	9 (5.2)	2.4 – 9.7
Surveillance	51 (29.7)	**23.0 – 37.1**
NR	11 (6.4)	03.2 – 11.2
Employment status with NCDC		
Casual/Volunteer	46 (26.7)	20.3 – 34.0
Contract/Corper	39 (22.7)	16.7 – 29.7
Full time	81 (47.1)	39.5 54.8
Partner (including NFELTP)	6 (3.5)	1.3 – 7.4
Duration with NCDC		
Over 2 years	70 (40.7)	33.3 – 48.4
6 months to 2 years	85 (49.4)	41.7 - 57.1
Less than 6 months	17 (9.9)	5.9 – 15.4
Grade Level, n = 148		
Grade 10 and below	141(95.3)	90.5 – 98.1
Grade 11 and above	7(4.7)	1.9 - 9.5
Underlying medical condition		
Yes	29 (16.9)	11.6 – 23.3
No	143 (83.1)	76.7 – 88.4
Types of underlying medical condition while infected with COVID-19, n=29		
Asthma	5 (17.24)	5.9 – 35.8
Hypertension	14 (48.28)	29.5 – 67.5
Diabetes	3 (10.34)	2.2 – 27.4
Malaria	3 (10.34)	2.2 – 27.4
Hypotension	1 (3.45)	0.09 – 17.8
Sepsis	1 (3.45)	0.09 – 17.8
Loss of smell and taste	1 (3.45)	0.09 – 17.8
Peptic ulcer	1 (3.45)	0.09 – 17.8
Deployment of during the Pandemic, n=172		
Yes	33 (19.2)	13.6 – 25.9
No	139 (80.8)	74.1 – 86.4

Staff of the NCDC are faced with occupational risk of COVID 19 as the agency is at the frontline of the response in Nigeria. A significant number of staff (i.e., 172) were infected with COVID-19 over the period of about 2 months following deployment to other states in Nigeria. It is possible that these staff failed to use the correct PPEs when attending to asymptomatic cases, thereby resulting in infection with COVID-19. Similar occupational risk has been reported by comparable centres. For instance, Wang et al (2020) reported 31 persons were infected with COVID-19 among staff of the Zhongnan Hospital of Wuhan University, China. Moreso, a study that evaluated COVID-19 infection among health workers in a primary health care facility in Ghana reported 14 out of 318 health workers were positive for COVID-19, and majority of these were asymptomatic.[12] In addition, a study conducted in 5 different hospitals in Ethiopia showed 39.6% seropositivity for COVID-19 among 1997 HCWs.[13] Also, similar studies conducted among HCWs in Somalia and Egypt showed high rate of COVID-19 transmission.[14,15] Nonetheless, considering that this is a novel infection with transmission patterns and sources yet to be fully understood, it is expected that the risk of infection might be significantly high within such frontline centres.

Despite being aware of the risk of infection and the provision of personal protective equipment (PPE) and safety guidelines, poor adherence could account for the risk of COVID19 infection especially among the younger staff who form the majority of those infected (i.e., 30 to 39 years). A study conducted in Ghana have also reported reduced use of PPEs among HCWs when attending to asymptomatic COVID-19 cases.[12] In addition, the surge of

Table 2. Possible Source/Location of Infection.

	Frequency N= 172, n (%)	95% CI
Environmental Source		
Use public transport	74 (43.0)	35.5 – 50.8
Use an ATM	89 (51.7)	44.0 – 59.4
Visit a bank and waited in the banking hall for 15min or more	19 (11.0)	6.8 – 16.7
Visited a marketplace	62 (36.0)	28.9 – 43.7
Attend a large gathering of 20 people or more	43 (25.0)	18.7 – 32.2
Attend a church or mosque	57 (33.1)	26.2 – 40.7
Person-to-person contact (i.e., contact with a confirmed COVID-19 case)		
Yes	112 (65.1)	57.5 – 72.2
No	60 (34.9)	27.8 – 42.5
Location where participant contacted a confirmed case, n=110		
Contact in the office	75 (68.8)	58.6 – 76.7
Contact outside the office	35 (31.2)	14.6 – 27.2
Adherence to COVID-19 Protocol		
Being around a confirmed case 10 – 14 days before diagnosis	70 (40.7)	33.3 – 48.4
Did not use face masks properly	40 (23.3)	17.2 – 30.3
Shake hands with people	26 (15.1)	10.1 – 21.4
Did not practice appropriate hand hygiene	30 (17.4)	12.1 – 24.0
Visited COVID-19 isolation/treatment centres without observing IPC	4 (2.3)	0.67 - 5.9
Cared for a confirmed COVID-19 case without observing IPC	2 (1.2)	0.14 – 4.1

Table 3. Challenges experienced by COVID-19 Infected NCDC Staff.

Challenges experienced upon confirmation	Frequency N=172, n (%)	95% CI
Delay in transportation to the nearest treatment centre	32 (18.6)	13.1 – 25.2
Difficulty in reaching the call centre	6 (3.5)	1.3 - 7.4
Delay in accessing care at the treatment centre	10 (5.8)	2.8 – 10.4
Delay in accessing entrance into the treatment centre	15 (8.7)	5.0 – 14.0
None	109 (63.4)	55.7 – 70.6
Experience rating at the isolation/treatment centre, n=105		
Very satisfactory	23 (21.9)	14.4 – 31.0
Satisfactory	49 (46.7)	36.9 – 56.7
Neutral	28 (26.7)	18.5 – 36.2
Not satisfactory	5 (4.8)	1.6 – 10.8

demand for COVID-19 test increased workload among staff of the NCDC; and the resultant burnout and psychosocial fatigue may have contributed to staff not adhering properly to safety protocols, thereby exposing them to the SAR-CoV-2 infection.

Behavioural risk factor is a major element that increases the risk of COVID-19 infection. The higher risk of COVID-19 among male staff of the NCDC compared to females may be due to high-risk behaviour. As reported by Griffith *et al*, males are less probable to adhere to COVID-9 preventive measures such as the use of non-pharmaceutical interventions (e.g. wearing mask, washing hands and social distancing).[16]

The source of infection among the staff of the NCDC remained uncertain. Though majority attributed the source of infection to environmental transmission such as the use of ATM, the actual source is still unclear. Several studies have documented a wide range of sources such as contact with surfaces at the airport when travelling, person to person transmission through contact with symptomatic patients and asymptomatic carriers, and frequently touched surfaces in healthcare settings.[17-19] Also, as reported by a study conducted in Ethiopia poor perception of COVID-19 exposure as well as poor decontamination of sensitive areas are major risk factors correlating with positive cases among HCWs.[20]

Nonetheless, laboratory personnel among the NCDC staff were the most affected. It is expected as the majority of those who travelled were laboratory personnel considering the need to set up more testing centres across the country to ease diagnosis of COVID-19 cases and for prompt isolation and management.

Due to the role played by public health laboratory personnel, direct contact with infected patients cannot be avoided since nasopharyngeal swaps must be collected to test suspected cases of COVID-19.[21] The different manual touchpoints before the laboratory automated stage may pose risk of infection to staff involved in the process - especially, during processes like sample dilution and aliquoting. As a result, this category of workers are more prone to being infected by COVID-19 as compared to other staff and the result from this study confirms this trend. A similar higher risk among laboratory personnel was reported by Abdulkarim Hasan et al., (2020). According to this study, there is a 2-fold increased risk of SARS-CoV-2 infection among laboratory personnel.

Irrespective of the personnel infected with SAR-CoV-2, there were mixed experiences among those infected ranging from tearful, anger to being frightened. Existing community stigma as well as the novelty of the virus may be responsible for these diverse yet negative reactions. Within NCDC, working long hours without adequate rest during the pandemic in addition to becoming infected may have contributed to the negative psycho-social experiences. As reported by Cuiyan Wang et al (2020), psychological experience following a stigmatized infection ranges from anxiety to depression. Similar experiences have been reported by other front-line workers.[22] For instance, a study in Algeria that assessed

Table 4. Experience of Stigmatization after COVID-19 Confirmation.

	N (%)	95% CI
Stigmatization, n=172		
Yes	37 (21.5)	15.6 – 28.4
No	135 (78.5)	71.6 – 84.4
Type of stigmatization experienced, n= 37		
Avoidance by friends and family	13 (35.1)	20.2 – 52.5
Avoidance by people	10 (27.0)	13.8 – 44.1
Avoidance at work	5 (13.5)	4.5 – 28.8
Poor treatment and avoidance at facility	5 (13.5)	4.5 – 28.8
Disengagement from organization	1 (2.7)	0.07 - 14.2
Afraid to disclose status	1 (2.7)	0.07 - 14.2
No response	2 (5.4)	0.7 – 18.2

Table 5. Support Received by Staff from NCDC.

Support received from NCDC	N (%)	95% CI
Financial, moral/social, or psychological support, n=172		
All 3 received (Financial, moral/social, and psychological support)	24 (13.95)	9.1 – 20.1
Only 2 received (financial & moral/social, or financial & psychological support; or moral/social & psychological)	142 (82.56)	76.1 – 87.9
Only 1 received (either financial, or moral/social, or psychological support only)	0 (0)	0.0 - 2.1*
Did not receive any support	6 (3.49)	1.3 - 7.4
Support adequacy, n=149		
Adequate	106 (71.1)	63.2 – 78.3
Non-adequate	43 (28.8)	21.7 – 36.8
Support helpful, n=153		
Yes	142 (92.8)	87.5 – 96.4
No	11 (7.2)	3.6 – 12.5

the psychosocial impact of COVID-19 reported high prevalence of anxiety and depression among HWCs.[23] In addition, a continent-wide study that explored the impact of COVID-19 on HCWs in 13 African countries showed increased level of depression and fear during the pandemic.[24]

This negative experiences highlight the need for safety nets such as psycho-social and financial support for frontline health workers or response team, especially those who become infected in the line of duty.[25] The NCDC introduced strategic psychosocial and financial support aimed at reducing the negative psychological experiences among its staff which was well received and reported as satisfactory by majority of the infected staff. Unlike the support provided by NCDC, report from some African countries show a different opinion. For example, a study conducted at a central hospital in Zimbabwe which explored the challenges faced by HCWs after confirmation with COVID-19 showed deficient psychosocial support and economic challenges related to HCWs bearing cost for diagnosis and treatment, experience of discrimination and stigma at the health facility and in the community in addition to lack of institutional support such as inadequate PPEs and COVID-19 testing.[26]

Compared with the number of people infected by SARS-COV epidemic in 2003, the total number of infections by COVID-19 is higher with daily increase and case fatality rate and unlike natural disasters such as hurricanes which require short-term emergency response, COVID-19 outbreak has a long-term implication.[25] This means front line health workers will have to deal with psychological and even social stress on a long-term basis.[25] Hence, additional planning is needed for managing such effect among front line staff. It is hoped that the financial support would be established to be sustainable as the risk of infection among frontline public health staff exists beyond pandemics.

Despite the provision of psycho-social and financial support, certain gaps in the management of infected staff were reported. Some of these gaps such as delay in accessing immediate pick-up services to the treatment/isolation centres as well as absence of prompt services at the treatment/isolation centres, added to the negative experiences. The advent of home-based treatment where appropriate, may address these gaps.

Every outbreak has peculiar elements, hence there is need for specialised preparedness training.[28] Due to the unexpected outbreak of COVID-19 with little known about the infection, and the short time available to get ready and equip staff, the preparedness training for emergency response may have been impaired and inadequate resulting in increased infection rates among deployed staff. Hence, the need for more robust preparedness training and capacity development focused on standard IPC measures.

Limitations

This is a cross sectional study and may be limited by recall bias. To reduce the effect of this bias in our result, the questions in the administered questionnaire were clear and precise to decrease variation in comprehension. In addition, forward recall strategy was employed in the questions asked, where causal sequence of events is followed with series of questions to enhance recall. Also, considering that participants did not use the same isolation centre during treatment, their responses may be dependent on the treatment/isolation centres where care is received.

Conclusions

There is significant occupational risk of COVID-19 infection especially among staff whose centres are at the front line. Psychosocial experiences among infected staff at these centres such as the NCDC is critical in driving policies aimed at reducing this occupational risk and the negative psycho-social experiences while improving services at the COVID-19 isolation/ treatment centres and strengthening capacity for future outbreaks.

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