Wearing of Face Masks in Response to COVID-19 Pandemic: The Nigerian Experience

O.T. OKAREH[1], A.O. GBADEBO[2], and A.A. UKAH

[1,2]Department of Environmental Health Sciences, Faculty of Public Health, University of Ibadan, Ibadan, Nigeria

Email: dapsy2001@yahoo.co.uk

Abstract

The novel Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), otherwise known as coronavirus Disease (COVID-19), needs to be combatted vigorously with all preventive measures, including face masks, to bring an end to the pandemic. Face masks could be very useful in the eradication of COVID-19 in Nigeria, but may not be very effective if used (alone) without other preventive measures. No guidelines have been given for the quality of materials used in making face masks, but improvisation and the use of cloth are allowed, while medical personnel are mandated to use medical masks. The use of face masks by all and sundry, also known as universal masking, is highly recommended in areas prone to high exposure and high rate of infection. In hospitals where patients come for treatment against COVID-19, the patients as well as the medical personnel are expected to use face masks to avoid contracting the disease. The multi-group Kermack-McKendrick-type epidemic model analysis showed that the use of face masks is a measure that is potentially more effective in providing protection against the coronavirus when combined appropriately with other preventive measures, especially when compliance is very high.

Keywords: Face masks, COVID-19, coronavirus, Kermack-McKendrick model.

Introduction

The emergence of new diseases in recent times has prompted numerous campaigns and interventions to curtail the spread of such diseases. The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), otherwise known as coronavirus disease (COVID-19), is the prevailing disease at the moment. I was first identified in 2019 in Wuhan city, China. The pandemic needs to be combated effectively with all preventive measures, including the use of face masks (Adeyeye, 2020).

The use of personal protective equipment (PPE) for protection against diseases, infections and accidents in both health and workplace settings can never be overemphasized. The categories of PPE include eye and face protection (face masks, face shields), hand protection (gloves), respiratory protection (respirators), body protection (body suits, coats, hard hats, boots), and hearing protection (earplugs, muffs). Facemasks like protective gowns, gloves or visors are used to protect individuals from splashes, spills or contamination from bacteria and viruses in a high risk environment. In hospitals, for instance, the PPE does not only protect the medical team from diseases, but also ensures diseases are not carried from the health care workers to patients.

Face masks are specially designed to create a barrier against infectious diseases that are airborne or can be contracted through aerosols (Adeyeye, 2020). Face masks come in different grades, quality and patterns depending on the severity of the exposure. Individuals in high risk areas like hospitals, health care centres and clinics are expected to wear the highest quality face masks, while individuals in low risk areas like offices, factories and industries are allowed to wear masks with average level of protection (Iboi, Sharomi, Ngonghala and Gumel, 2020).

Face masks are defined as flat or pleated strapped materials with tested fluid and air penetrative abilities (European Standards, 2019; ASTM, 2020). As documented, the Federal Government of Nigeria issued a warning to the citizens of the country that there would be a penalty for individuals caught without wearing a mask in public, but Nigerians have not been careful enough to wear their masks regularly. The use of face

masks could be very useful in the eradication of COVID-19 in Nigeria, but may not be very effective if it used (alone) without other prevention measures (Iboi et al., 2020).

On March 30th, 2020, lockdown measures were instituted, which included the use of face masks. However, these measures need to be followed strictly and continued for months until the pandemic curve is flattened. On May 4th, 2020, lockdown measures were eased to allow offices and banks reopen, especially in commercial cities, and the use of face masks was made compulsory. However, many people refused to adhere to this, while some of those who wore the facemasks were observed not to wear them properly. This paper generated information about the use of face masks in Nigeria in combating the COVID-19 pandemic using literature synthesis and personal reflections.

Literature Review

Since it is not certain that face masks alone can prevent the spread of COVID-19, its use is recommended alongside other safety measures like social distancing and regular hand washing (Adepoju, 2020; Ogoina, 2020). The use of face masks also serves as a means of preventing transmission of SARS-CoV-2 from an asymptomatic infected person to an uninfected person (Ogoina, 2020; Ngonghala et al., 2020).

The SARS-CoV-2 is commonly spread through aerosols, mostly with the presence of aerosol-generating practices (AGP) like coughs and sneezes. There have been reported cases of the presence of virus ribonucleic acid (RNA) in settings where there are high aerosol-generating practices (WHO, 2020d). In AGP dominated areas, where there was poor usage of adequate PPEs, including face masks, the viral RNA for COVID-19 was prominent and easily transmitted from symptomatic patients to persons in close contact. For mild cases, the virus was not viable after 8 days of the onset of symptoms.

However, whether the virus is viable or not, the spread of SARS-CoV-2 was greatly reduced with the adequate and continuous use of PPE, especially face masks in conjunction with other safety measures (WHO, 2020d). There are specific guidelines to be considered in using face masks for respiratory protection by health workers. These include the effectiveness and continuous use of medical masks as well as respirators

in the prevention of severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS) (WHO, 2020d).

Likewise, universal masking is being practiced in hotspots of coronavirus outbreaks, especially at medical centres in such areas. It is also compulsory for medical and health workers to wear face masks anytime they are on duty or while taking shifts and to change the masks intermittently after attending to patients, especially those in critical medical conditions, to avoid cross-contamination of patients. Medical personnel, health workers and care givers are also advised not to share masks and also to change masks when wet, soiled, or damaged. In cases where masks are touched, such should be removed carefully to avoid further contamination (WHO, 2020d).

The multi-group Kermack-McKendrick-type epidemic model analysis showed that the use of face masks is a measure for combating the coronavirus that is more effective when used appropriately and combined with other prevention measures (Eikenberry et al., 2020).

Another mathematical model by Ngonghala et al. (2020) showed that the ease of lockdown and use of prevention measures including face masks could lead to a second wave of the epidemic. The model affirmed that the continuous extension of these measures will curtail the spread of COVID-19 in the United States of America. Therefore, non-adherence to the use of facemasks could hinder the expected flattening of the COVID-19 pandemic curve (Adepoju, 2020).

Methodology

In order to obtain valid documented information about the use of masks in combating COVID-19 in Nigeria, a combination of official media reports, literature synthesis and personal reflections were used in this study. In a mathematical model, involving the simulation of a Kermack-McKendrick-type epidemic model, Eikenberry et al. (2020) projected that with 80-90% compliance of wearing face masks, COVID-19 could be reduced to the barest minimum. In Nigeria, however, the compliance rate is not as high as 80% (Iboi et al., 2020). The Kermack-McKendrick-type epidemic model predicts the number and distribution of cases of an infectious disease as it is transmitted through a population over time. The model also indicates the effect of the age-of-infection on the transmission

and removal rates in a population. The model is of seminal importance in the field of theoretical epidemiology. This model, as reported by Eikenberry et al. (2020), is adopted in this review and is as described below:

$$R_{Is} = (1-r)\beta s(1-\varepsilon_M c_M)/\varphi s + \gamma s + \Delta s \qquad \text{and} \qquad R_{Ia} = r\beta a(1-\varepsilon_M c_M)/\gamma a$$

where $Rc = R_{Is} + R_{Ia}$

The parameters represented in the model above are as follows:

Rc = control reproduction number (an average number of new COVID-19 cases generated by newly-introduced infectious humans)

R_{Is} = new cases generated by symptomatically-infectious humans

R_{Ia} = new cases generated by asymptomatically-infectious humans

s = symptomatically-infectious individuals

a = asymptomatically-infectious individuals

βs = Effective community contact rate (a measure of social-distancing effectiveness) [among symptomatically-infectious individuals]

βa = Effective community contact rate (a measure of social-distancing effectiveness) [among asymptomatically-infectious individuals]

$1-r$ = Fraction of exposed individuals who show clinical symptoms at the end of the incubation period

r = Fraction of exposed individuals who did not show clinical symptoms at the end of the incubation period

c_M = Proportion of members of the public who wear masks in public (i.e., masks compliance)

ε_M = Efficacy of face masks in preventing acquisition of infection by susceptible individuals

Is = Population of symptomatically-infectious individuals

Ia =   Population of asymptomatically-infectious individuals

$(\gamma s)(\gamma a)$ =   Recovery   rate   for   individuals   in   the $(Is)(Ia)$ compartments respectively

Φs =   Hospitalization rate for infectious individuals.

Δs =   Disease-induced mortality rate for infectious individuals

Following this model, Rc (control reproduction number), which is an average number of new COVID-19 cases generated by a newly-introduced infectious person, was calculated for Nigeria and Lagos State, one of the most populated states in Nigeria.

Results and Discussion

The default parameter values are shown in Table 1 while the fitted parameter values for both Nigeria and Lagos are shown in Table 2. The disease-induced mortality rates for Lagos and the whole of Nigeria were the same while the hospitalization rate in the whole nation was twice as much as that in Lagos alone.

Table 1: Default baseline values of the parameters in the Kermack-McKendrick-type epidemic model

Parameters	Default Values
ε_M	0.5
c_M	0.1
σ	$1/5.1 \text{ day}^{-1}$
R	0.5
φs	0.025 day^{-1}
γa	$1/7 \text{ day}^{-1}$
γs	$1/7 \text{ day}^{-1}$
γh	$1/14 \text{ day}^{-1}$

TABLE 2: Fitted parameters of the Kermack-McKendrick-type epidemic model using cumulative mortality data for Nigeria and Lagos

Fitted Parameters	Nigeria	Lagos State
Bs	0.487	0.403
Ba	0.380	0.325
Δs	0.043	0.043
Δh	0.103	0.186
Φs	0.080	0.044
Rc	2.24	2.01

Source: Iboi et al., 2020

The effective contact rate among symptomatic patients (βs) was high, which depicts that measures of social distancing and use of face masks were not applied as expected. This was also reflected in the high value of the contact reproduction number (*Rc*). The *Rc* was far from zero which reveals that the virus is still prominent within the population. The farther the *Rc* from zero, the more the presence of the virus in the population.

However, if face masks of moderate efficacy (50%) were used appropriately, there would have been very high reduction in COVID-19 cases in Nigeria. Likewise, if face masks of low efficacy (25%) were used, the simulation model showed mortality could increase to as much as 200,000 deaths by 2021, while it could be as much as 220,000 if masks were not used at all. The model also showed a corresponding fall in the pandemic curve if more masks were used in public, and the curve would consistently flatten if higher efficacy masks are used by more people in the society (Iboi et al., 2020; Ngonghala et al., 2020).

As shown in Figure 1, there was a reduction in the control reproduction number as mask efficacy and mask coverage increased in the whole of the nation (a) and also in Lagos, Nigeria (b). It is projected that this reduction needs to continue until it is close to zero in order to totally eradicate the virus. We emphasize here the fact that face mask use alone is not enough to eradicate the COVID-19 pandemic unless; it must be combined with other preventive measures to achieve total eradication.
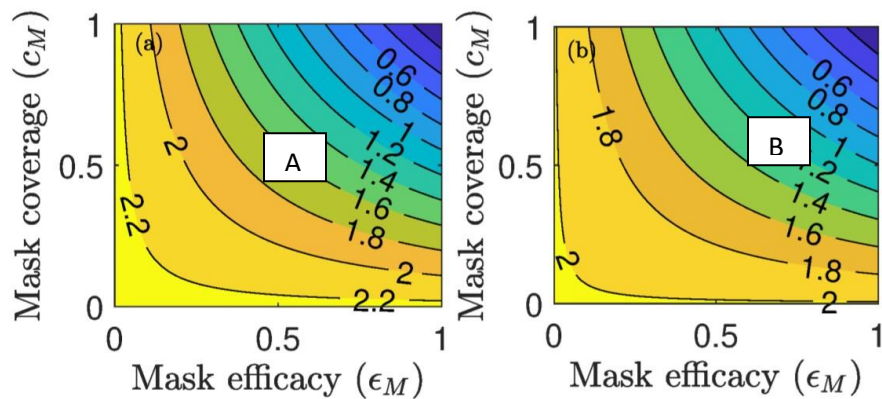
Figure 1: The contour plots of mask coverage (cM) against mask efficacy (eM) in Nigeria (a) and Lagos (b) showing the control reproduction numbers (Iboi et al., 2020).

It was observed that some people in public circles only wear masks when they sight Police or government officers, because of fear of punishment by the law (Ogoina, 2020). However, the use of face masks, including face shields, was strictly observed in most government offices, hospitals, ministries, departments and agencies (Ogoina, 2020). Likewise, during the country's sixtieth-year independence celebration at the Eagle Square in Abuja, the Federal Capital Territory on October 1st, 2020, all government officials and invited guests observed the COVID-19 prevention measures of wearing face masks or face shields and social distancing.

A special type of face mask, the N95 respirator, which has exhalation valves was seen, worn by highly-placed individuals, the wealthy, and top government officials, probably because of the high quality and convenience, but the masks were discovered to have a low rate of exhaling respiratory gases, thus most of the exhaled carbon dioxide particles tend to be inhaled (Ukpe, 2020).

The two major types of masks are the medical and non-medical masks.

Medical face masks: These include surgical masks and respirators. Medical masks are recommended for use by medical workers and other people in hospitals and treatment centres. The filtration capability of these masks should be 95%. Other specifications include breathability (49 Pascal/cm^2), fluid resistance, pressure drop/difference (below 100 Pascal) and filter quality (Q) factor, which should not be less than 3 kiloPascal units (WHO, 2020a).

a) Surgical masks: These are masks made from disposable non-woven fabric (polypropylene) consisting of multiple layers commonly worn by health and medical personnel in hospitals and other health settings. Surgical masks have the potential to stop most air particles, contaminants and aerosols, hence preventive enough against most airborne diseases.

b) Respirators: These are masks with exhalation valves and are more sophisticated and expensive than the surgical masks. The various types are the N95, N98 and KN95. They equally have the potential to stop most air particles, contaminants, aerosols and microorganisms as small as 0.3 microns, which include viruses, thus, are more effective than surgical masks.

Respirators effectively cover both the nose and the mouth, leaving no space, unlike the surgical masks. They also act as barriers to very small fine particles. They are made of mesh-like polymer fibre.

i. N95 Respirator Masks: The N95 respirator is designed to stop at least 95% of airborne particles and microbes in the range of 0.3 micron sizes and above if properly fitted and used according to the manufacturer's guidelines.

ii. N98 Respirator Masks: The N98 respirator is designed to stop at least 98% of airborne particles and microbes in the range of 0.25 micron sizes and above if properly fitted and used according to the manufacturer's guidelines.

iii. KN95 Respirator Masks: The KN95 respirator is similar to the N95 in its function and efficacy. The major differences are the manufacturer, the design and face fitting. KN95 masks are

manufactured in China as opposed to the US for the N95 (Adeyeye, 2020).

Non-medical Face Masks: These are the types of face masks most commonly used by the majority of people in Nigeria. They are also known as barrier face masks because they are made not with medical specifications but just to provide a physical barrier to air particles. They are made mostly of cotton fabrics and other textiles. Unlike the medical masks, they cannot filter out most microorganisms, hence cannot be recommended for medical personnel. However, some institutions like the University of Ibadan, through the Academic Staff Union of Universities (ASUU), embarked on the production of cotton fabric face masks with the aim of incorporating medical specifications. They were tested and found to have the potential to stop most air particles, contaminants, aerosols and microorganisms.

Barrier masks can also be made of polyester and nylon fabrics, but preferably 100% single material. A simple test of blowing off a flame placed in front of the wearer of the mask is normally done to test the thickness and efficacy of non-medical masks. Some of these masks have been found not to prevent diseases, but with the use of hand sanitizers and hand washing practices, the spread of diseases could be reduced among non-medical mask users. Barrier masks should be washed every day for a period of time and then disposed of because the quality and thickness of the cloth gets reduced with repeated use and washing. For increased efficacy, non-medical masks should be double-layered.

Availability and adherence to the use of face masks in Nigeria

No guidelines were given by the authorities for the quality of materials that should be used in making face masks. Thus people took to improvisation and the use of cloth in making these face masks. However, medical personnel were mandated to use medical masks (NCDC, 2020b).

The improvisation of masks made it more available and affordable for all and sundry. Many entrepreneurs have ventured into making face masks. It has become a good source of economic empowerment, especially for the youth. However, the quality of most of the materials

used is questionable while the process of manufacturing could easily be compromised if not well monitored.

Many individuals in public places in Nigeria are seen wearing their masks inappropriately, such as putting the masks on their chin or neck especially when talking, while some others indiscriminately touch their masks in the process of adjusting it severally. These actions could endanger the health of citizens and encourage the spread of the coronavirus disease. Many that use cotton fabric face masks do not wash them regularly, thereby making them vehicles for the transmission of pathogenic organisms or the coronavirus. Thus, there is a need for more awareness about personal hygiene. Figure 2 shows various cotton fabric face masks of different colours made for commercial purpose. It is essential to package them appropriately to avoid contamination.

Figure 2: Cotton fabric face masks of different colours in Nigeria (Adepoju, 2020).

Challenges associated with the use of face masks and socio-economic implications in Nigeria

The purchase of face masks and changing them regularly constitute a challenge to poor citizens, especially low-income earners and other individuals living below the one-dollar-per-day income because of the cost of buying or making the mask. In rural settings where the level of

hygiene and sanitation is poor, there is high anxiety and fear of spreading the virus due to poor sanitation practices and mode of disposal of used face masks, especially in areas where little children can easily pick the COVID-19 materials from the ground. Also, dump sites where used COVID-19 materials are disposed of are not properly monitored to avoid undue exposure to the virus (Ogoina, 2020). In Nigeria, many face mask users complain about shortness of breath while some say they feel dizzy whenever they use face masks. These are user- discouraging factors (Ogoina, 2020).

Numerous changes have occurred since the outbreak of COVID-19. These include reduction in the number of people at social gatherings and reduction in the output of manufacturers, with the exception of face mask manufacturing companies. Millions of face masks were sold during the lockdown which dividends will still be reaped during the post-COVID-19 era. Figure 3 shows a man selling face masks and shields on a highway in Ibadan. Many people learnt the art of making these masks in order to make ends meet.

Figure 3: A man selling cloth face masks and face shields along a major highway in Ibadan, Southwest Nigeria (Adepoju, 2020).

Public health concerns

Improper wearing of face masks and improper disposal of used ones have been major public health concerns in the fight against COVID-19 in recent months.

In rural settings where the level of hygiene and sanitation is poor, there is high anxiety and fear of the virus spreading due to poor sanitation practices and mode of disposal of used face masks, especially in areas where little children can easily pick materials off the ground. Disposal mechanisms are critical for public health because improper disposal could cause contact with infected masks and could encourage the spread of the pandemic.

The history of face mask use dates as far back as the eighteenth century but the mode of disposal in most settings has not been ethical and safe for general health and the environment (Feng et al., 2020). Inappropriate disposal and inadequate use of face masks were reported in rural settings in Nigeria, while in some cases, disposable face masks were washed and reused.

Primarily, the purpose of preventive measures like the use of face masks is to mitigate or eradicate the spread of the coronavirus disease (WHO, 2020b). Many countries all over the world have been adopting measures to curb the spread of the COVID-19 pandemic, part of which include the use of face masks (CDC, 2020; Feng et al., 2020; WHO, 2020c). However, the World Health Organization (WHO) has debunked the claim that face masks can absolutely prevent coronavirus; they can only reduce the rate of transmission (NCDC, 2020a).

The compulsory use of the face mask by all and sundry, also known as universal masking, is highly recommended in areas prone to high exposure and high rate of infection. For example, in hospitals where patients come for treatment against COVID-19 disease, the patients as well as the medical personnel are expected to use face masks. The WHO further stated that the consistent use of face masks by healthy and uninfected individuals could protect them from exposure to the virus from infected persons, both symptomatic and asymptomatic (NCDC, 2020c).

The Nigeria Centre for Disease Control (NCDC) also gave a similar directive on how to prevent the disease by regular use of face masks, but stated that this can only be very effective if worn properly and with observance of other preventive measures like social distancing and regular hand washing (NCDC, 2020a).

During the course of this study, in markets, and other places where large numbers of people congregate and where wearing of masks is enforced, people were seen hawking face masks of different shapes and sizes, some of which are of very doubtful quality. In most cases, the face masks were exposed in an unhygienic manner and buyers did not consider the rate of exposure and contamination before buying. It was also observed that some people wore their face masks for long periods without replacement (Matthew, 2020; NAFDAC, 2020; Salao, 2020; Umeha, 2020).

Conclusion

The use of face masks in Nigeria cannot be adjudged to be widely embraced by every citizen at the moment. However, every citizen including patients, health and non-health workers in every state, city and village in the country should be encouraged to use face masks. Public mask wearing in Nigeria will be most effective against COVID-19 pandemic if used properly by everyone and combined with other preventive measures. The federal and state governments should support or source for funds, resources and procedures for proper implementation of guidelines for face masks production, including monitoring of every manufacturer and health facilities for proper adherence to all protocols. It is critical to address issues of Personal Protective Equipment and preventive measures, especially the use of face masks, which will help to curtail the spread of the dreaded SARS-CoV-2 in Nigeria.

References

Adeyeye, M.C. (2020). Covid-19 Personal Protection Equipment (PPEs) – Masks and Protective Clothing. NAFDAC.

Adepoju, P. (2020). Coming into terms with COVID-19 in one of Nigeria's Major cities. *Pandemis and Emergencies*

ASTM Committee. (2020) Specification for Performance of Materials Used in Medical Face Masks. ASTM (American Society for Testing and Materials) International. (https://doi.org/10.1520/F2100-19E01, accessed 4 June 2020).

CDC/Coronavirus Disease. (2020). Recommendation Regarding the Use of Cloth Face Coverings. Available at: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html. Accessed April 23, 2020.

Eikenberry, S.E., Mancuso, M., Iboi, E., Phan, T.,Kostelich, E., Kuang, Y., Gumel, A. B. (2020). Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic. *Infectious Disease Modeling*, 5: 293–308.

European Standards. (2019). Medical Face Masks -Requirements and Test Methods. (https://www.en-standard.eu/une-en-14683-2019-ac2019-medical-face-masks-requirements-and-test-methods/), accessed 4 June 2020)

Shuo Feng, Chen Shen, Nan Xia, Wei Song, Mengzhen Fan and Benjamin J Cowlin. (2020). Rational use of face masks in the COVID-19 pandemic. *Lancet Respir Med,* 8, 434–436.

Iboi, E., Sharomi O. O., Ngonghala, C., and Gumel A. B. (2020). Mathematical Modeling and Analysis of COVID-19 pandemic in Nigeria. https://doi.org/10.1101/2020.05.22.20110387medRxiv preprint doi

Matthew, A. (2020). Bizzare! These Women Were Seen Washing Used Nose Mask in Order to Resell! Naija Super Fans. Available at: https://naijasuperfans.com/bizzare-these-women-wereseen-washing-used-nose-mask-in-order-to-resell-see-pictures/. Accessed May 5, 2020.

NAFDAC. (2020). COVID-19 Personal Protection Equipment (PPEs) – Masks and Protective Clothing. Available at: https://www.nafdac.gov.ng/covid-19-personal-protection-equipmentppes-masks-and-protective-clothing/. Accessed May 1, 2020.

Nigeria Centre for Disease Control. (2020a). Advisory on the Use of Masks by Members of the Public without Respiratory Symptoms. Available at: https://covid19.ncdc.gov.ng/resource/ guideline/UseOfMasks.pdf. Accessed April 23, 2020.

Nigeria Centre for Disease Control. (2020b). Advisory on Use of Cloth Face Masks. Available at: https://covid19.ncdc.gov.ng/media/ files/UseOfClothFaceMasks.pdf. Accessed May 5, 2020

Nigeria Centre for Disease Control. (2020c). Advisory on Use of Cloth Face Masks. Available at: https://covid19.ncdc.gov.ng/media/ files/UseOfClothFaceMasks.pdf. Accessed May 5, 2020.

Ngonghala, C.N., Iboi, E., Eikenberry, S., Scotch, M., MacIntyre, C.R., Bonds, M.H., Gume, A.B. (2020). Mathematical assessment of the impact of non-pharmaceutical interventions on curtailing the 2019 novel coronavirus. *Mathematical Biosciences*, 325, 108364.

Ogoina, D. (2020). Perspective piece COVID-19: The need for rational use of face masks in Nigeria *Am. J. Trop. Med. Hyg.*, 103(1), 33–34 doi:10.4269/ajtmh.20-0433 The American Society of Tropical Medicine and Hygiene.

Salao, G. (2020). Improper Use, Disposal of Facemasks, Hand Gloves Could Trigger COVID-19 Community Transmission in Nigeria. The Guardian Newspaper. Available at: https://guardian. ng/news/improper-use-disposal-of-facemasks-hand-glovescould-trigger-covid-19-community-transmission/. Accessed May 3,2020.

Umeha, C. (2020). NIDS Warns Against Misuse, Abuse of Face Masks to Prevent COVID-19. Independent Newspapers Nigeria. Available at: https://www.independent.ng/nids-warnsagainst-misuse-abuse-of-face-masks-to-prevent-covid-19/. AccessedMay 3,2020.

Ukpe, P. (2020). NMA: Shortage of Protective Equipment Due to Poor Funding for Health—The Whistler NG. The Whistler. Available at: https://thewhistler.ng/nma-shortage-of-protectiveequipments-due-to-poor-funding-for-health/. Accessed April 23, 2020.

World Health Organization (WHO). (2020a). Advice on the use of masks in the context of COVID-19. 2020, [cited 15 July 2020]. Available from: https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novelcoronavirus-(2019-ncov)-outbreak

World Health Organization. (2020b). Coronavirus Disease 2019 (COVID-19) Situation Report -73. Available at: https://www. who.int/docs/default-source/coronaviruse/situation-reports/ 20200402-sitrep-73-covid-19.pdf?sfvrsn=5ae25bc7_6.Accessed April 23, 2020.

World Health Organization. (2020c). Strategic Preparedness and Response Plan for the Novel Coronavirus. Available at: https:// www.who.int/publications-detail/strategic-preparedness-andresponse-plan-for-the-new-coronavirus.AccessedMay5,2020

World Health Organization. (2020d). CC BY-NC-SA 3.0 IGO licence. WHO reference number: WHO/2019-nCov/IPC_Masks/2020.4