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## **Coronavirus: COVID-19-Epidemiology, Treatment, Prevention and Control**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Author UCD designed the study, wrote the first draft of the manuscript, managed the analyses and managed the revision of the article. Author EEB wrote the protocol and some part of the pathogenesis. Both authors read and approve the final manuscript.*

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### **ABSTRACT**

Coronavirus infection is a zoonotic disease of viral origin. The SARS-CoV-2 is the novel virus that causes the ongoing pandemic affecting the global community hence a very big threat to the global public health. Coronavirus disease 2019 (COVID-19) was first detected Wuhan, China and reported to World Health Organization (WHO) country office in China on 31<sup>st</sup> December 2019. It has since been spreading, resulting in an ongoing pandemic. As at 19 May, there are about 4.8 million cases of Covid-19 with 316,169 deaths reported in more 188 countries of the world. The initial transmission appeared to be from an animal source, but there has been person to person transmission in the affected countries. A lot of preventive and control measures have employed to severe transmission. Strategies in the control of an outbreak are containment or suppression and mitigation. Currently there is no specific vaccine or treatment for COVID-19. This work reviewed the Coronavirus Disease 19, its epidemiology, pathogenesis, symptoms, diagnosis, treatment, prevention and control.

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## 1. INTRODUCTION

COVID-19 is a respiratory viral infection by a novel coronavirus also known as SARS-CoV2. Coronavirus has hitherto been in existence but totally ignored and has gone unnoticed until the recent outbreak which started in China in November 2019. The outbreak has graduated to a pandemic, ravaging human population and crumpling the global economy to the subsequent lock down (total movement restriction) and social distancing observed in a bid to severe transmission of the virus in humans. COVID-19 is an emerging disease believed to be of animal origin.

Coronavirus is a species of the family of virus-Coronaviridae that causes various diseases such as pneumonia, fever, breathing difficulties, lung infection, dry cough [1]. During the outbreak in Wuhan, China in 2019, the virus and the disease were commonly referred to as “coronavirus” and “Wuhan coronavirus” [2] and sometimes called “Wuhan pneumonia” [3]. This is not surprising as many diseases had been named after the geographical locations they were first found. The World Health Organization however recommended the name 2019-nCoV in January 2020 [4] and described 2019-nCoV as an acute respiratory disease [5]; as temporal names for the virus and the disease. The renaming was per 2015 guidance and international guidelines against using geographical locations (e.g., Wuhan, China), animal species or groups of people in disease and virus name to prevent social stigma [6]. The official name COVID-19 and SARS-CoV-2 were issued by World Health Organisation (WHO) on 11<sup>th</sup> February 2020 [7]. According to Tedros Adhanom the chief of WHO, ‘Co’ stands for Corona, ‘Vi’ for virus, ‘D’ for disease and ‘19’ for the year of first identified outbreak (31<sup>st</sup> December, 2019) [8]. WHO uses COVID-19 virus in communication and reporting and it means virus responsible for COVID-19.

## 2. CORONAVIRUS DISEASE 2019

*Coronavirus* refers to any virus belonging to the family Coronaviridae. Coronaviruses are a large family of viruses that are known to cause illness ranging from common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). SARS virus first emerged in humans in 2002, likely originated

from animal reservoir believed to be horseshoe bats. MERS emerged in 2012.

Coronaviruses are enveloped viruses and measure about 120 nm (1 nm  $10^{-9}$  meter) in diameter. Club-shaped glycoprotein spikes in the envelope give the viruses a crown-like or coronal appearance. The nucleocapsid is helical or tubular and is made up of a protein shell of capsid. The coronavirus genome consists of a single strand of positive-sense RNA.

Coronaviridae family of virus has two genera: **Coronavirus** and **torovirus**, which differ in their nucleocapsid morphology. While coronavirus has a helical morphology; torovirus is tubular.

Coronavirus was identified with the discovery of SARS-CoV in 2002. With recent detection, there are now seven human coronavirus. Coronavirus first emerged in the mid-1960s and there are seven types of the virus broken into four groups: Alpha, beta, gamma and delta. Common human coronaviruses are:

229E (alpha coronavirus), NL63 (alpha coronavirus), OC43 (beta coronavirus), HKU1 (beta coronavirus).

Other human coronaviruses include: MERS-CoV (the beta coronavirus that causes severe acute respiratory syndrome-SARS) and SARS-CoV-2 (the novel coronavirus that causes coronavirus disease 2019- COVID-19) [9]. Each of them has different characteristics. SARS-CoV was first reported in 2002. It has only recently been introduced to the humans. Other strains are present many upper and lower respiratory disease in human [10].

## 3. EPIDEMIOLOGY OF COVID-19

Coronavirus disease 2019 (COVID-19) is commonly associated with acute respiratory disease in elderly people, young adults as well as infants. It has been found to have a severe effect on elderly people and those with underlying health issues, often resulting in fatality. Antibodies to respiratory coronaviruses appear in childhood, increase in prevalence with age and are found in more than 90% of adults. Initially, it was only contacted by people who travelled to countries where the outbreak is ongoing but later graduated to cluster local

transmission from infected people to population at risk.

COVID-19 was first detected in Wuhan, China and the virus subsequently spread to all provinces of China and to more than 188 other countries in Asia, Europe, North America, South America, Africa, and Oceania. The outbreak was declared a Public Health Emergency of International Concern on 30<sup>th</sup> January 2020. On 11<sup>th</sup> March, WHO declared the coronavirus outbreak a 'pandemic' [11]. The coronavirus outbreak in China was first reported as a cluster of patients with pneumonia of unknown cause which was linked to a local Huanan South China Seafood in Wuhan, Hubei Province, China in December 2019 [12]. As at 19<sup>th</sup> May 2020, this outbreak that erupted in China, which is an ongoing pandemic has resulted in about 4.8 million cases, 216,169 deaths of COVID-19 reported in more than 188 countries. According to WHO situation report #120 on 19<sup>th</sup> May, 2020, African countries have a total of 63,521 cases and 1796 deaths; Americans -2082945 cases and 124 668 deaths; Eastern Mediterranean have 356749 cases and 10,149 deaths; South East Asia-148 761 cases with 4 780 deaths and Western Pacific countries have 169 178 cases with 6 765 deaths [13].

Coronavirus case in Nigeria: The first case in Nigeria was first confirmed on Friday February 27<sup>th</sup>, 2020 in Lagos in a business Italian traveler who arrived Nigeria on February 25<sup>th</sup> 2020 and became symptomatic on February 26, 2020. As at May 24, 2020, Nigeria has 7 839 cases and 226 deaths of coronavirus disease [14].

#### **4. SOURCE AND TRANSMISSION OF COVID-19**

Sars-CoV-2 is the virus that causes COVID-19. The initial transmission appeared to be from an animal source, but there has been person-to-person transmission in affected countries. The virus can spread from one person to another, most likely through droplets of saliva, mucus or discharge from the nose when an infected person exhales, coughs, sneezes or talks [7,15]. The droplets usually fall to the ground or onto surfaces rather than travelling through air over long distance [15]. People can also be infected by touching a contaminated surface and then touching their faces [7,15]. It can easily be spread or contacted by another person during few days after the onset of symptoms although spread is possible before symptoms appear,

and from people who do not show symptoms [7,15].

#### **5. PATHOGENESIS**

The pathophysiology of coronavirus-19 is not yet fully understood. There is still ongoing research concerning this. Although the details of the cellular responses to this virus are not known, a probable course of events can be postulated using the past studies on SARS-CoV. COVID-19 seems to target mainly the respiratory system. The inhaled virus cells likely bind to the epithelial cells in the nasal cavity and starts replicating. Angiotensin- converting enzyme 2 (ACE 2) is the main receptor for both SARS-CoV-2 and SARS-CoV [16,17]. *In vitro* data with SARS-CoV indicated that the ciliated cells are primary cells infected in the conducting airway [18]. There is local propagation of the virus but a limited innate response. At this stage, the virus can be detected by nasal swabs. Although the viral burden may be low, these individuals are infectious.

In another stage, the virus propagates and migrates down the respiratory tract along the conducting airways and a more robust innate response is triggered. Nasal swabs or sputum yield the virus as well as early markers of the innate immune response. At this time, the disease COVID-19 is clinically manifesting [19]. The level of CXCL10 (or some other innate response cytokine) may be predictive of the subsequent clinical course [20].

#### **6. SYMPTOMS OF COVID-19**

Common symptoms include fever, dry cough, breathing difficulties like shortness of breath, and loss of smell [7,21,22], muscle ache and pain. In severe disease: difficulty waking (confusion), bluish face or lips, coughing up blood, persistent chest pain, decreased white blood cells, kidney failures and high fever [22].

#### **7. INCUBATION PERIOD OF COVID-19**

The time from exposure to onset of symptoms is typically around 5 days but may range from 2 to 14 days [15].

#### **8. DIAGNOSIS OF COVID-19**

COVID-19 can be diagnosed on the basis of symptoms and confirmed using reverse transcription polymerase chain reaction (RT-PCR

testing of infected secretions or CT imaging of the chest [23]. The respiratory secretions are mostly collected using a nasopharyngeal swab, though other samples can be used. For example, a number of laboratories and companies have developed serological tests which detect antibodies produced by the body in response to infection [24].

## 9. TREATMENT OF COVID-19

Currently, there are no specific vaccines or treatments for COVID-19. However, there are many on-going clinical trials evaluating potential treatments. Treatment may include relieving of symptoms (pains, cough, hydration, difficulty breathing) and supportive therapies. FDA however granted permission for some medications approved for diseases to be used in to treat severe COVID-19 when no other options are available. Two malaria drugs hydroxychloroquine and chloroquine- and an antiviral drug, remdesivir, have been approved for this use [25].

## 10. PREVENTION AND CONTROL OF COVID-19

The best way to prevent and severe transmission is by sensitizing the public about coronavirus, the disease it causes and how it spreads. Other preventive measures include frequent washing of hands with soap in a running water, use of alcohol-based sanitizer on the hands, avoiding touching of face (nose, eyes, and mouth), social distance observance among individuals in public gathering, use of face mask in public settings; boosting the immune system by eating healthy, taking vitamin C tablets or fruits rich in vitamin C etc.

Strategies in the control of an outbreak are containment or suppression, and mitigation. Containment is undertaken in the early stages of the outbreak and aims to trace and isolate infected individuals as well as introduce other measures of infection control and vaccinations to stop the disease from spreading to the rest of the population. Some of the control measures for COVID-19 include:

- Contact tracing- This aims to determine the source of the infection and prevent further transmission. The possible contacts of an isolated case are traced, contacted and quarantined for 14 days [26].

- Isolation- This is used to separate ill persons who have the virus disease from those who are healthy. Isolation restricts the movement of ill persons to help stop the spread of certain diseases including coronavirus disease [26].
- Quarantine –quarantine is a way of separating and restricting the movement of well persons who may have become ill. These people may have been exposed to a disease and do not know it, or they may have the disease and do not show symptoms [26].
- One can cough into his or her elbow or cover mouth and nose properly with tissue paper when sneezing and/or coughing and immediately dispose of the tissue in a covered waste bin, after which hands are to be washed and sanitized.
- Use of face mask by infected individuals.
- Avoiding close contact with anyone showing symptoms of COVID-19 illness such as coughing and sneezing.
- Health care workers are often advised to observe standard infection prevention and control measures when attending to patients and take a travel history of patients (this is in order to ascertain patients who may have travelled to countries where coronavirus is affected and are at risk of the infection or spreading the infection)
- Monitoring and self-isolation for people who may suspect they are infected [26].

In addition to these control measures, many countries affected by coronavirus pandemic set up some policies to reduce the transmission of the virus. Examples of such policies are: International flight restriction, enhanced contact tracing and expansion of testing capabilities to cover a lot of the masses, enhanced screening at international airports, the term ‘total lockdown’ was introduced which implied to general restriction of movement to include closing down of markets, places of religious worship (mosques and churches), workplaces, schools, banks and other places where there is usually social gathering; training and recruitment of health personnel to fight the pandemic etc.

## 11. CONCLUSION

COVID-19 is an emerging viral disease which is still ongoing. The causative microorganism *Coronavirus* easily mutates and this made it

difficult to fully understand it hence no particular treatment or vaccine against the viral infection. This implies that all hands must be on deck to prevent the transmission of the virus since this is the only way of mitigating and containing this virus in human population.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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