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Facts About Coronavirus Disease And How It Differs From Ebola Virus Disease

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Abstract

Coronavirus disease is currently the most talked about disease every day in America and practically all countries in the world. It has caused the greatest health and economic havoc in the history of America and possibly the history of mankind. It is caused by a novel coronavirus, SARS-CoV-2, first identified on December 31, 2019 in Wuhan, China. The purpose of this article is to concisely bring out the known facts about COVID-19 and its etiology, Coronavirus or SARS-CoV-2. It is also to bring out the differences between COVID-19 and Ebola virus disease(EVD). The information was procured through literature search. The search showed that a lot has been found and learnt about COVID-19. Information on health concerns are included in this study with the geographical distribution of the disease and a little about treatment and its potential for vaccine prevention. The major differences between novel coronavirus disease and Ebola virus disease were brought out in tabular form for ease of comprehension. Also, significant and notable dates about COVID-19 and EVD are included in this study. While the search for effective vaccine for COVID-19 is needful, it requires considerable efforts and will probably take an inordinate amount of time to accomplish. It is strongly recommended that more time be spent on identifying effective treatment drug(s). It is an indisputable fact that coronavirus disease pandemic has had immense adverse impact on the world and no effort should be speared to control it.

Keywords: Facts, Coronavirus disease, pandemic, Ebola virus disease.

1.0 Introduction

Coronavirus disease pandemic is the order of the day. It is practically the most talked about every day in America and practically all countries all over the world. It has caused the greatest health and economic crisis in the history of America as a nation and possibly mankind in this Millennium. A myriad of information is recorded about it practically every day and everywhere in different news media (scientific journals, radio broadcasts television programs, etc). Occasionally some diseases suddenly surface in some human populations. An example is SARS (Severe Acute Respiratory Syndrome) which occurred in China; Zika Virus which occurred in South America and HIV/AIDS (Acquired Immune Deficiency Syndrome), which is pandemic, occurred and is still occurring in many countries including the US and Nigeria (Acholonu, 2017).

Coronavirus disease is another one like these and appears to be more devastating than the other recent pandemics. The purpose of this article is to concisely bring out the known facts about the coronavirus disease pandemic and to crystalize what we know about it so far as compared to the Ebola Virus Disease (EVD), its predecessor and vividly bring out their differences.

This disease has caused more deaths than any other pandemic in recent times and has yet to stop. While much is now known about it, there is still a lot more we do not know. It is called man's invisible enemy. It has affected every fabric of life and caused untold havoc practically everywhere in the world. It has caused untold grief to many families. It is a grave concern to mankind.

1.1 Historical and Taxonomic Facts About Coronavirus

Coronavirus is a family of viruses, which can cause the common cold or more severe diseases such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) and the new coronavirus disease that first appeared in late 2019 in Wuhan, China and called COVID-19. (https://coronavirus.jhu.edu/map.html). It was first

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identified on Dec. 31, 2019 (https://www.doctorswithoutboders.org(covid19). The virus is now called SARS-CoV-2, named by the International Committee on Taxonomy of Viruses.

On February 11, 2020, the World Health Organization (WHO) named the disease caused by the new coronavirus: COVID-19. "CO" stands for corona, "VI" for virus, "D" for disease, and 19 refers to 2019, the year it was first discovered. It is a close cousin to the SARS and MERS viruses that have caused outbreaks in the past. All three of these viruses are betacorona viruses and have their origins in bats.

Coronaviruses are common in many people and many species of animals, including camels, cattle, cats, and bats, according to the Centers for Disease Control and Prevention (CDC). On March 11, 2020 the WHO declared the coronavirus disease a pandemic, meaning that it has spread globally.

Coronaviruses are enveloped positive stranded RNA viruses in the family Coronaviridae and the order, Nidovirales. With their characteristic surface, the virions have a crown–like appearance under the electron microscope, which is why the viruses are named after the Latin word corona, meaning 'crown' or 'halo' (European Center for Disease Control (ECDC), 2020). They were identified in the mid – 1960s.

Coronavirus virions are spherical to pleomorphic enveloped particles. The envelope is studded with projecting glycoproteins, and surrounds a core consisting of matrix protein enclosed within which is a single strand of positive – sense RNA associated with nucleoprotein. The envelope glycoproteins are responsible for attachment to the host cell (Figures 1 and 2) (ECDC, 2020); (https://www.ncbi.nlm.nih.gov/books/NBK7782).

2.0 Epidemiology/Prevalence

2.1 Geographical distribution

Since the first reports of cases from Wuhan, a city in the Hubei Provence of China at the end of 2019, cases have been reported in all continents, except for Antarctica.

Of the 54 nations of Africa, only six countries have

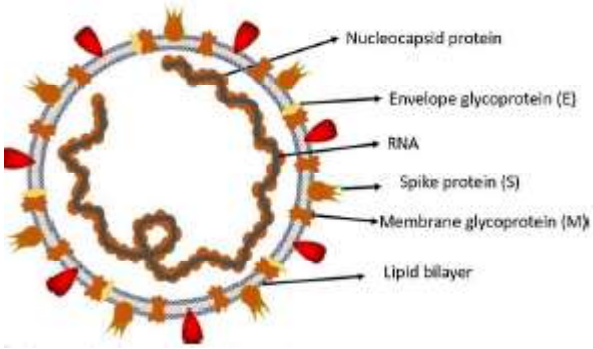

Figure 1: Structure of novel coronavirus showing its taxonomic parts.
(see https://www.sciencedirect.com/science/article/pii/S2090123220300540)

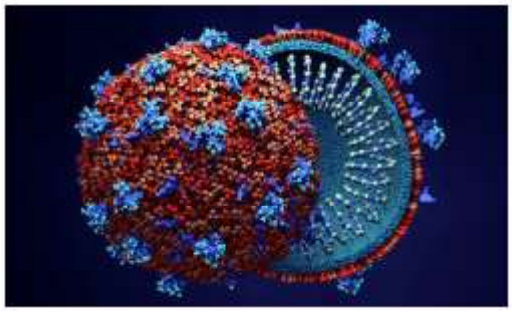

Figure 2: Coronavirus image. (see https://www.livescience.com/how-coronavirus-infects-cells.html

not reported cases of coronavirus disease. They are: South Sudan, Burundi, Sao Tome and Principe, Malawi, Lesotho and Comoros. Authorities from these countries claim that they have been speared by God or have simply been saved by the low volume of air traffic to their countries. However, some fear it is simply a lack of testing. (https://www.trtworld.com/africa/these-six-countries-in-africa—have-no-reported-cases-of-coronavirus-34999). The future will tell.

In the United States, COVID-19 has been reported in all 50 States, Washington DC, and at least four territories. The prevalence is still increasing practically day by day. As of June 10, 2020, the global prevalence reported is 7,264,866; deaths are 411,874. In the USA, it is 1,979,971 cases; deaths are 112,006. In Mississippi, it is 19,448 cases and deaths are 881. In Nigeria, it is 13,464 cases; and deaths are 365 according to Johns Hopkins University, US Department of Health, Mississippi Department of Health and Nigeria Center for Disea-

se Control respectively.

2.2 Transmission

Epidemiologic investigation in Wuhan at the beginning of the outbreak identified an initial association with a seafood market that sold live animals where most coronavirus patients had worked or visited and which was subsequently closed for disinfection. As the outbreak progressed, person-to-person transmission became obvious and was confirmed. This is mainly through respiratory droplets that become airborne when an infected person coughs, sneezes, or speaks.

Asymptomatic COVID-19 carriers can also transmit the disease to others. The virus is usually transmitted via inhalation of contaminated droplets, but it may also be transmitted by the hands to the mucosa of the nose or eyes.

Environmental contamination– Virus present on contaminated surfaces is another source of infection or transmission if susceptible individuals touch these surfaces and then transfer infectious virus to mucous membranes in the mouth, eyes, or nose. This is a potential source of infection in settings where there is heavy viral contamination (e.g. in an infected individual's household or in health care settings) (McIntosh, 2020).

2.3 Symptoms and Pathology

COVID – 19 is a contagious or infectious disease that causes mild to severe respiratory infection with fever, cough, and shortness of breath. It has a wide spectrum of severity.

Most people infected with the disease will experience mild to moderate respiratory disorder and recover without requiring special treatment. Older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, and cancer will more likely develop serious illness. The comorbidities may include hypertension, chronic lung disease, obesity and smoking. It may also cause pneumonia.

Severe illness can occur in otherwise healthy individuals of any age, but it predominantly occurs in adults with advanced age or underlying medical comorbidities. Adults of middle age and older are most commonly affected and older adults are more likely to have severe disease and increased mortality. Asymptomatic infections do occur. (Some patients that are COVID-19 carriers can also transmit the disease to others. Some COVID-19 patients do not suffer from fever or other abnormalities on initial presentation, which usually complicates the diagnosis).

The severity of COVID-19 infection ranges from very mild (sometimes with no reported symptoms at all) to severe, to the point of requiring hospitalization. The absence of fever in COVID-19 is more frequent than in SARS-CoV (1%) and MERS-CoV infections (2%), so afebrile patients may be missed if the surveillance case definition focuses on fever detection (Wei-jie *et al*., 2020). Recent publications have evaluated the survival of SARS-CoV-2 on different surfaces. The environmental stability of viable SARS-CoV-2 is up to 3 hours in the air post aerosolization, up to 4 hours on copper, up to 24 hours on cardboard, and up to 2 – 3 days on plastic and stainless steel (ECDC, 2020).

The symptoms can appear anywhere between 2 to 14 days after exposure with a median incubation period of from five to six days. In addition, the virus displays a high infectivity.

3.0 Diagnosis

3.1 Clinical Diagnosis

The possibility of COVID-19 should be suspected mainly in patients with new onset fever and/or respiratory tract symptoms (e.g. fever, cough, dyspnea etc.). It should also be suspected in patients with severe lower respiratory tract illness without any clear cause and other noted symptoms. These can serve as justification for testing.

3.2 Laboratory Diagnosis

To test for COVID-19, a health care provider should use a long swab to take a sample from the nose or throat. The samples should then be sent to a lab for testing. If a person is coughing up saliva or sputum, they may be sent for testing too.

4.0 Prevention and Control

The following preventive actions are recommended: Wash hands with soap and water for at least 20 seconds. Dry them thoroughly with an air dryer or clean towel. If soap is not available, use a hand sanitizer with at least 60% alcohol. Stay home if you are sick. Avoid touching the nose, eyes, and mouth. Use a tissue to cover a cough or sneeze, then dispose of it in the trash. Use a household wipe or spray to disinfect doorknobs, light switches, desks, keyboards, sinks, toilets, cell phones, and other objects and surfaces that are frequently touched (CDC). Additionally, when in public, wear a mask or cloth face covering that covers the mouth and nose.

The likelihood of transmission can be reduced by practicing the above and other relevant hygienic measures.

4.1 Treatment

The treatment of coronavirus disease is symptomatic. At present, there is no effective cure for SARS-CoV-2 infection and the most common treatment for patients with COVID-19 is supportive care and oxygen supplement. Multiple anti –viral drugs, including remdesivir and lopinavir plus ritonavir, have been used in clinical practice, but the safety and efficacy of these are still unclear and are under clinical evaluation (see Figure 3) (Zhong *et al*., 2020). Treatment is concentrated at reliving the symptoms. These may include pain relievers, cough syrup or medication, plenty of rest and fluid intake. So, at present, there is an urgent need to develop therapies for treatment of coronavirus disease.

Figure 3: Coronavirus disease patient under treatment (https://covid19.tabipacademy.com/2020/06/20/a-cheap-steroid-might-be-the-first-covid-19-drug-to-save-lives/)

4.2 Vaccines /Immunology

There is as yet no available vaccine against COVID-19. Although research teams all over the world are working to investigate the key features, pathogenesis and treatment options, it is deemed necessary to focus on competitive therapeutic options and cross-resistance of other vaccines (Muhammad *et al*. 2020). Immunity does not persist, and subjects may be re-infected, sometimes within a year. (David *et al*. 2020).

5.0 Significant and Notable Dates in the History of COVID-19

i. Dec. 31, 2019: In Wuhan, China, reports surface of people with pneumonia due to an unknown cause -novel coronavirus.
ii. Jan. 30, 2020: The CDC confirms the first human-to-human transmission of COVID-19 in the United States (https://www.cnn.com/2020/01/30/health/coronavirus-illinois-preson-to-person-cdc/index.html).
iii. Feb 11, 2020: The WHO names the illness COVID-19. (https://apnews.com/9139690066c6f00272151c9871bf03d5)
iv. Feb. 27, 2020: First report of COVID-19 in Nigeria when an Italian citizen in Lagos tested positive.
v. March 11, 2020: The WHO declares COVID-19 a pandemic
vi. March 11, 2020: First case of COVID-19 was reported in the State of Mississippi
vii. March 17, 2020: Coronavirus cases are now present in all 50 U.S. States

5.1 Significant and Notable Dates in the History of Ebola Virus Disease

i. 1976: Date that Ebola virus disease (EVD) was first discovered.
ii. March 23, 2014: World Health Organization(WHO) reported first time, cases of Ebola virus disease in southeastern Guinea; officially declared an outbreak of EVD
iii. July 23, 2014: Ebola virus disease was confirmed in Lagos, Nigeria
iv. January 14, 2016: United Nations (UN) declared that outbreak of Ebola virus disease in West Africa had stopped (contained).
v. 2014 – 2016: Duration of Ebola virus disease in West Africa.

6.0 Conclusion

The novel coronavirus disease is a human scourge, mankind's invisible enemy. It is perhaps the worst pandemic in the history of mankind or one of the worst.

This article is written to serve as a quick concise reference to what is known so far about coronavirus disease and its etiology, SARS-CoV-2, reported in an avalanche of publications. There is still more to be learned about the novel virus and its effects on human beings. There is as yet no effective vaccine developed against it even though strenuous efforts, both political and scientific, are being made to come up with one. It is the considered opinion of the author that this is a herculean task. Development of a vaccine has many ramifications and requires an inordinate amount of time. Although scientists have been working on vaccine for HIV/AIDS, Ebola virus disease, Zika virus disease and several others for many years, success has yet to be achieved. When vaccine for COVID-19 is found, the next problem, among others, will be finding the duration of the immunity. The duration for the following is known: cholera – 65% protection for 2 years; Yellow fever – life long protection for many people; *Leishmaniasis tropica* – self limiting, life long; measles–life long; Influenza - about 6 months. More time and effort should be spent on finding an effective treatment. Remdesivir has been used in some clinical practice. But its safety and efficacy are still in doubt and not confirmed.

To add more relevance to this article, significant and notable dates have been included for quick reference to both COVID-19 and EVD. The major differences between COVID-19 and EVD have been provided in tabular form for quicker comparison (see Table 1). Also, see Ebola virus and disease in Figures 4 and 5 for more contrast. Ebola virus disease was prevalent in Africa and was not pandemic. But the coronavirus disease is pandemic and appears to be more prevalent in the US, Europe and Asia. It is less prevalent in Africa and this is comparatively minimal. Available information shows that the COVID-19 cases reported as of June 10, 2020 in the world, USA, Mississippi and Nigeria are as indicated under Epidemiology. Again, as of August 31, 2020, global cases were 25,259,201

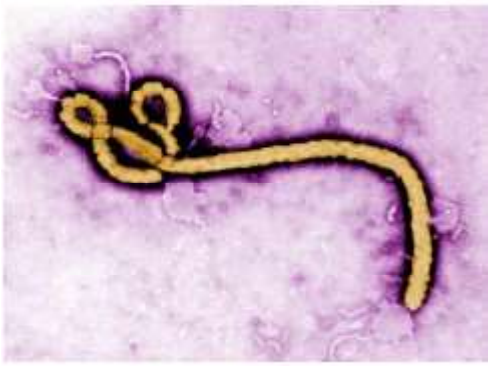

Figure 4: Image of Ebola Virus. https://www.webmd.com/a-to-z-guides/ebola-fever-virus-infection.

Figure 5: Woman died of Ebola disease, bleeding. Picture shows maculopapular rash on the skin of the patient. (https:/indiaopines.com/ebola-virus-man-made-la).

and deaths, 847,107; USA cases were 6,002,615 and deaths, 183,203; Mississippi cases were 83,584 and deaths, 2493; and Nigeria cases were 54,247 and deaths, 1,023. So, the prevalence is continuing with no end in sight as compared to Ebola virus disease which lasted from 2014 to 2016 and was epidemic in West Africa. Mississippi as a small State in the USA with a population of about 3 million, has 19,448 cases and 881 deaths in June 10, 2020 and 83,584 cases and 2493 deaths in August 31, 2020 but Nigeria with a population of over 200 million, has 13,464 cases and 365 deaths in June 10, 2020 and 54,247 cases and 1023 deaths in August 31, 2020 only. This is remarkable and encouraging for Africa and most specifically Nigeria. Could there be a reason or reasons for this? This is a question for future scientists to answer. It is envisaged that this trend will continue. Ebola virus disease came and has been contained. It appears that COVID-19 will linger for a long time except and unless an effective remedy is found for it. This is because its

Table 1: Differences between Ebola virus disease and Coronavirus disease

Ebola Virus Disease	Coronavirus Disease
Origin Ebola viruses are some of the deadliest viruses known to man. It was first identified in 1976 in separate outbreaks in former Zaire (now, Democratic Republic of Congo) Africa.	**Origin** The original outbreak in china of COVID-19 is thought to have occurred at the human Seafood Market (a wet market) in Wuhan, China. The very first cases of COVID-19 were identified in China on December 31, 2019.
Intermediate Host Intermediate hosts include primates, various rodents, etc. It is zoonotic.	**Intermediate Host** Intermediate host not known yet.
Spread/Epidemiology Ebola Virus disease is spread by direct contact with body fluids and not airborne.	**Spread/Epidemiology** SARS-CoV-2 is a respiratory tract infection. It is highly infectious or contagious and is spread via airborne means.
Pathology The Zaire Ebola Virus strain was 90% fatal and eventually contained (It caused an acute and devastating disease that was often deadly).	**Pathology** The fatality of SARS-CoV-2 varies. It causes asymptomatic, mild to severe disease with fever, cough, shortness of breath etc. (This has made it difficult to contain the infection.
Prevalence Ebola virus disease was epidemic and occurred in Africa.	**Prevalence** SARS-CoV-2 is pandemic and is occurring all over the world.
Taxonomy Ebola viruses belong to the Filoviridae family of viruses and are negative sense RNA viruses with helical symmetry.	**Taxonomy** Novel coronavirus (SARS-CoV-2) is a member of the Coronaviridae family of viruses. It is a positive sense RNA virus. It is spherical.
Transmission Ebola is transmitted by direct contact via body fluids (such as blood, feces, or vomit) or fomites contaminated by body fluid. Humans are neither the natural host nor reservoir. Fruit bats serve as the natural hosts. Infected bats transmit to primates, rodents, and other animals via excrement. Humans contract the virus when they hunt and kill these animals.	**Transmission** The novel coronavirus, SARS-CoV-2, is an airborne disease and is spread by respiratory secretions in much the same manner that flu viruses spread. Infection with SARS-CoV-2 can be transmitted also by asymptomatic people. (It causes mild to severe respiratory illness including cough, shortness of breath and fever) It is transmitted through person to person contact mainly through respiratory droplets that become airborne.
Symptoms Sudden onset of fever, intense weakening, muscle pain, headache and sore throat. This is followed by vomiting, diarrhea, rash, impaired kidney and liver function and in some cases both internal and external bleeding. Incubation period is 2 – 21	**Symptoms** Symptoms can mimic a common cold, flu, or allergic response. In some cases, it can lead to severe pneumonia. The cases are mild, severe and critical (In most individuals the disease is mild. In those who are older or with comorbidity it can lead to a very serious illness with

pathology covers a wide spectrum of forms: asymptomatic to mild to severe to fatal.

It is an indisputable FACT that coronavirus disease pandemic has adversely affected the world beyond measure and needs to be contained as in the case of Ebola virus disease.

As more information become available, it is recommended that subsequent investigators augment the much material provided here. It is obvious that not enough is known about this contagious malady. As research on it continues, more will be learned and recorded.

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References

Acholonu, A.D.W. (2017). Some facts about Ebola Virus Disease and comments on the Nigeriansituation and control measures taken **2((1):** 7 – 11.

Center for Global Health (2020) 21 facts about Ebola virus disease. 1 – 2. (globalhealth.musc.edu/blog/21-facts-about-ebola- virus-disease). Accessed: May 26, 2020.

David, A. J., Tyrrell and Steven H. Myint Chapter 60 Coronaviruses (https://www.ncbi.nih.gov/books/NBK77821). Accessed: May 21, 2020

Doctors Without Borders. (2020). Coronavirus: Facts and Figures. 2 – 24. (https:www.doctorswithoutborders.org/covid19). Accessed: May 11, 2020.

European Center for Disease Prevention and Control (ECDC) (2020). Disease background of COVID 19. (https://www.ecdc.europa.eu/en/2019-nocv-background-disease). Accessed: May 11, 2020.

Mayo Foundation for Medical Education and Research (2020). Coronavirus disease 2019 COVID-19: 1 – 7.

Mclntosh, K. (2020). Coronavirus disease 2019 (COVID-19): Epidemiology, Virology, Clinical Features, Diagnosis and Prevention- Up-to-date. (https://www.uptodate.com/contents/coronavirus-disease-2019-covid-epidemiology-virology-clinical-features-diagnosis-and-prevention). Accessed: May 21, 2020.

Muhammad, A. S. *et al*. (2020). COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses. (https://doi.org/10.1016/j.jare.2020.03.005). Accessed: May 21, 2020.

Shereen, M. A., Khan, S., Kazim, A., Bashir, N., Siddique, R (2020). COVID-19 infection: Origin, transmission, and characteristics of human coronavirus. J. Adv. Res. **24:** 91 – 98.

Sizemore, R. C and Zaman, M. S. (2020). Ebola virus and SARS-Cov-2: Similarities and Differences. Journal of Health and Social Sciences, Advance Publication on line May 15, 2020 24 pp.

TRTWORLD (2020). These six countries in Africa have no reported cases of coronavirus. 1 – 10 (htps:www.trtworld.com/Africa/these-six-countries-in-africa-have-no-reported-cases-of-coronavirus-34999). Accessed: June 10, 2020.

Wei-jie *et al*. (2020). Clinical characteristics of coronavirus disease 2019 in China. N. Engl. J. Med. **382:** 1708 – 1720. (https://www.nejm.org/doi/full/10.1056/NEJM2002032). Accessed: May 21, 2020.

World Vision (2020) what is the coronavirus? Facts, symptoms, and how to help 1 – 24 (https://www.worldvision.org). Accesses: May 11, 2020.

Zhong, J. *et al*. (2020). The immunology of COVID-19: Is immune modulation an option for treatment? The Lancet: Rheumatology (DOI: https://doi.org/10.1016/52665-9913(20)30120-X). Accessed: May 25, 2020.