Current Updates on COVID-19 Pandemic: Facts Versus Myths

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Abstract

Coronavirus disease 2019 (COVID-19) is a ravaging infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Since it outbreak in December 2019 in Wuhan, China, it has spread to some 225 countries and territories worldwide. Conscientious efforts have been made by world governments, academia, civil rights organisations, private bodies and humans in general to contain this dreaded disease that has crippled world economy. These ranged from repurposing of existing drug moieties to the development of vaccines. While these were ongoing, supportive therapy was the only viable option for the effective management of the infection. As with other disease outbreaks, tons of myths were circulating in the public domain especially social media platforms, pseudo-online news media and the internet at large. Such misinformation does no good other than to complicate the disease spread and outcome and in some cases could potentiate death or near-death cases in individuals whose ears were tickled by them. With the current nature of COVID-19, frequent updates are essential to help all and sundry safely navigate this sea infested with many crocodiles. Several emerging reports shows that COVID-19 could lead to an array of diseases including but not restricted to diabetes, neurological disorders, autoimmune disorders and autoinflammatory diseases, such as paediatric inflammatory multisystemic syndrome. This article aims to update existing knowledge as regards COVID-19, its diagnosis and prognosis, current statistics, impact on other disease conditions, vaccines as well as clear the air on the myths surrounding the disease.

Keywords: COVID-19; Circulating Myths on COVID-19; COVID-19 Facts; COVID-19 Vaccines

Abbreviations

ACE: Angiotensin Converting Enzyme; COVID-19: Coronavirus disease 2019; DNA: Deoxyribonucleic Acid; HCoV: Human Coronavirus; ICTV: International Committee on Taxonomy of Viruses; MERS-CoV: Middle East Respiratory Syndrome Coronavirus; MIS-C: Multisystem Inflammatory Syndrome in Children; PCR: Polymerase Chain Reaction; PIMS: Paediatric Inflammatory Multisystemic Syndrome; RVD: Retroviral Disease; SARS: Severe Acute Respiratory Syndrome; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

Introduction

Since the outbreak of the novel coronavirus disease that has spread to more than 220 countries and territories of the world [1], there has equally been an upsurge in circulating myths, especially on the social media and pseudo-online news media. This has staged a serious confusion especially in the developing and underdeveloped nations of the world. Left unaddressed, the fears generated by these myths may further complicate the disease outcome. Little wonder the Director General at the World Health Organization (WHO), Dr T. A. Ghebreyesus, said: "Our greatest enemy right now is not the virus itself. It is fear, rumours and stigma. And our greatest assets are facts, reason and solidarity".

What facts are available about the 2019 coronavirus outbreak? To start with, since its emergence in December 2019 in Wuhan, China, the WHO originally recommended the provisional designation 2019-nCoV (2019 novel coronavirus) to refer to the virus. Other renditions were Wuhan coronavirus, new coronavirus amongst others. In an attempt to avoid the use of prejudicial informal names for the virus and in tandem with the 2015 WHO guidelines on the naming of viruses and diseases [2,3], the International Committee on Taxonomy of Viruses (ICTV) proposed the introduction of a suitable name for the virus. As of February 11, 2020, the ICTV announced that the 2019-nCoV will now be known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). On the same day, the WHO officially announced the renaming of the disease caused by this virus from 2019-nCoV acute respiratory disease to coronavirus disease 2019 (COVID-19). SARS-CoV-2 is one of 36 coronaviruses in the family *Coronaviridae* within the order *Nidovirales*. The family is made up of large, single-stranded RNA viruses isolated from several species, that are known to cause respiratory or intestinal infections in humans and other animals including bats, cattle and pangolin [4,5]. They are tagged corona based on their distinctive morphology; the crown-like appearance of the surface projections (Figure 1). Because of its strong genetic similarity to bats coronaviruses, bats are implicated to be the origin of this novel virus strain. However, some schools of thought point to the pangolin as possible intermediate reservoir [5,6]. The novel coronavirus (SARS-CoV-2), though clustered within the SARS/SARS-like coronaviruses, is different from the MERS-CoV and SARS-CoV [7,8]. Current fact reveals a considerable genetic distance between the Wuhan CoV and the human-infecting SARS-CoV and even greater distance from MERS-CoV.
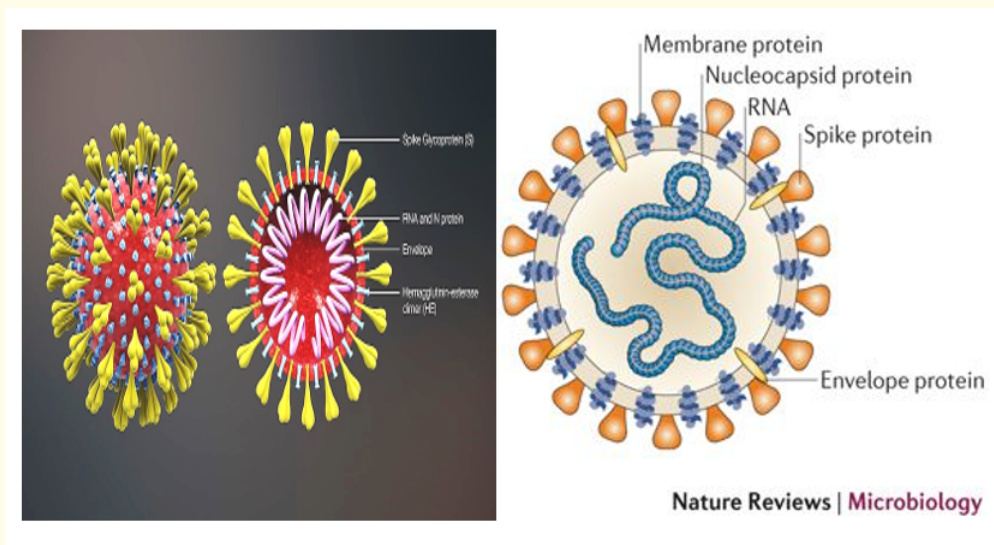

Figure 1: *Molecular structure of the SARS-CoV-2 virus [9].*

Initially, animal to human transmission was considered the origin of the pandemic, chiefly as many patients disclosed that they visited a local fish and wild animal market in Wuhan sometime around November 2019. More recently, evidence confirms human-to-human transmission [10] primarily through respiratory droplets from coughs and sneezes from an infected individual within a 1.8m radius [11]. Also, the viral RNA has been found in stool samples obtained from infected persons, suggesting a possible oral-faecal transmission route [11]. Furthermore, contaminated hands and inanimate surfaces like door handles, tables etc. is believed to be potential media for transmission [12]. Kampf., *et al*. [13] reported that SARS-CoV, MERS-CoV and HCoV can persist on inanimate surfaces such as glasses, metals, table tops and plastics up to 9 days duration. This likely explains the rapidity of the infection, disease and its outcome.

Current statistics

Globally, as of May 20, 2021, there are about 166,005,711 confirmed cases, more than 3,439,000 deaths and more than 145,000,000 recovered cases were reported in more than 220 countries and territories worldwide [4,14]. In Nigeria, about 165,852 confirmed cases, 2,067 total deaths and 156,456 total recovered cases have been officially reported. These data are constantly changing by the hour. The basic reproduction number (R_0) of the virus is between 1.4 and 3.9, meaning that each infection from the virus would typically be expected to result in 1.4 to 3.9 new infections.

Incubation period and risk factors

The average time between exposure and onset of clinical manifestation of symptoms is typically 5 days, though it may range from 2 - 14 days. Common symptoms include shortness of breath, a progressive cough, fever, chills, fatigue, sore throat, headache, muscle aches and pains, anosmia (either partial or complete loss of smell), ageusia and dysgeusia (complete and partial loss of taste respectively), gastrointestinal symptoms amongst others. The disease is not as deadly as people assume but its severity is dependent on age and the presence of concurrent or underlying disease conditions. For instance, children, the elderly and patients with diabetes mellitus, RVD, malignancies and other immunosuppressive conditions as well as pregnant women will likely experience the severest form of COVID-19. A normal healthy adult will likely recover without much complication.

Detection and diagnosis

Diagnosis is critical for isolating infected patients in order to reduce the spread of the virus. SARS-CoV-2 cannot be tested like malaria and typhoid infections or as HIV test. Remember, for many people the symptoms are cold-like symptoms so some of the people who think they could be infected will only have a cold and can be sent home. With the emergence of the third waves in some countries, hospitals are being overwhelmed with samples to test so they need a quick way of getting results back to doctors and their patients. Infection with 2019-nCoV is confirmed by detection of the viral genetic material using PCR. Samples from the respiratory system of suspected patients are collected and sent to the lab. In a sample of phlegm there would be human cells containing replicating virus particles and therefore the viral RNA. Reverse transcriptase is used to synthesise the corresponding DNA and specific primers are used to amplify a specific region only found in 2019-nCoV (and also SARS). If PCR yields the amplified copies then these can be further analysed by sequencing.

Mechanism of Infection

Another known fact is the mechanism of viral entry into the host body. It has been reported that the spike (S) protein of the viral RNA exploits its affinity for the human cell angiotensin converting enzyme (ACE2) receptors (Figure 2a) and penetrates the host cell via this mechanism [15]. Wrapp., *et al*. [16] and Xu., *et al*. [15] both reported the SARS-CoV-2 to have higher affinity for human ACE2 than the SARS-CoV-1 (original SARS virus strain that was implicated in the 2002 global epidemic). Thus, it poses significant public health risk for human transmission via the S-protein-ACE2 binding pathway. It is important to note that dynamics of cross-species or human-to-human

transmission of coronaviruses can be affected by factors such as the host's immune response, efficiency of viral replication (Figure 2b), or rate of virus mutation. As research is ongoing, it is believed that its mechanism of entry into the host cell may likely be a target for therapeutic interventions and drug discoveries.
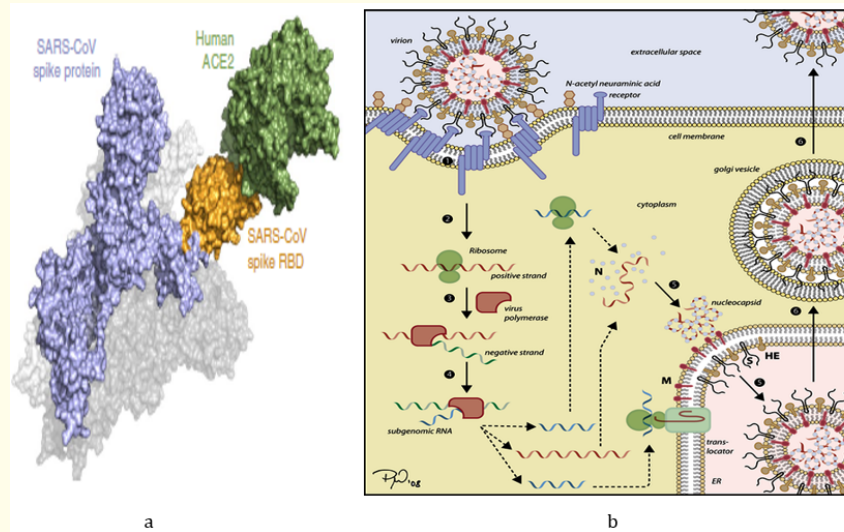

Figure 2: 3D-Structural representation of the SARS-CoV-2 virus with exposed binding sites for interaction with host cell receptor via the RBD in spike (a) [17] and mechanism of viral replication (b) [18].

Disease association

The presentation and nature of clinical manifestations seen in COVID-19 appear to be ever-increasing, with new case-reports appearing daily. Extrapulmonary complications have been reported in many instances of COVID-19, including neurological symptoms. The third wave of virus is seriously being considered to potentiate Parkinsonism and/or worsens the quality of life of patients already diagnosed of Parkinson's disease. Pathophysiologically, chronic neuroinflammation is believed to be critical to the pathogenesis of Parkinson's disease and COVID-19 is known to activate inflammatory cytokines, which may drive neurodegeneration. Till date, reported COVID-19 neurological symptoms include headaches, dizziness, hyposmia, impaired consciousness, ataxia, neuralgia, epilepsy and encephalitis amongst others.

The ravaging COVID-19 has been linked to autoimmune and autoinflammatory diseases such as Paediatric Inflammatory Multisystemic Syndrome (PIMS e.g. toxic shock syndrome, Kawasaki disease shock syndrome, myocarditis and macrophage activation syndrome) in children [19-21] and are typically characterised by single- or multi-organ dysfunction, although less serious presentations, such as abdominal pain, vomiting and diarrhoea have also been reported [22]. It is a known fact that infectious diseases usually provokes autoimmune and autoinflammatory conditions chiefly through molecular mimicry as a mechanism of action. Reports of PIMS-like presentations with COVID-19 was first reported in April 2020 [20,21] and subsequently, PIMS temporally associated with SARS-CoV-2 (PIMS-TS) cases have been reported globally [23]. As of 12th May 2020, a total of 224 cases of PIMS were reported across Europe [24]. In the United States, where PIMS-TS is known as Multisystem Inflammatory Syndrome in Children (MIS-C), 1659 cases and 26 deaths were reported as of January 08, 2021 [22].

For some persons, recovery and survival from COVID-19 may potentiate lasting medical conditions such as newly diagnosed diabetes. Sathish and colleagues [25] that about 14.4% patients hospitalized with severe COVID-19 also developed diabetes. There is no evidence that the SARS-CoV-2 virus directly impacts negatively on the pancreatic beta cells. Type 1 diabetes is frequently diagnosed post-acute illness such as viral gastroenteritis or influenza especially as such conditions provoke exaggerated immune responses including ones directed at the islets cells of the pancreas. This attack by the immune system causes an all-sudden loss of the insulin-producing beta cells resulting in an acute hyperglycaemia. Once the acute illness is resolved, the autoimmune response subsides and the pancreas may resume producing some insulin. The latter is termed the "honeymoon phase" and is characterised by relative insulin deficiency and abnormal glucose regulation, thus requiring minimal doses of insulin. However, when the phase elapse or suddenly stops, daily need of insulin becomes essential. The honeymoon phase is thought to have occurred because there were still few insulin-producing beta cells whose fate needed more time to be determined the autoimmune attack. This explains why Type 1 diabetes is associated with COVID-19, a known acute influenza-like illness. Also, Type 2 diabetes has been linked to COVID-19 and is majorly due to the acute stressors such as gestation, steroids and activation of pro- and inflammatory cytokines. Often times, patients diagnosed of Type 2 diabetes after survival a bout of coronavirus disease must have been prediabetic and the acute inflammation associated with COVID-19 and/or the steroidal treatment exploited in its management precipitate diabetes in such folks.

Treatment options

At the earliest and prior to the emergence of vaccines, there were no specific antiviral drug therapies for COVID-19 and rigorous researches focused on the repurposing of existing drug moieties (e.g. Chloroquine phosphate®, Remdesivir®). In October 2020, Remdesivir (Veklury®) became the first therapeutic agent approved by the United States Food and Drug Administration (FDA) for the treatment of COVID-19 and still remains the only approved drug by the said body for this ravaging disease. However, FDA has also granted emergency use authorizations (EUAs) for some medications. This means that products yet to be approved by FDA could be used for the infection especially in circumstances with no suitable FDA-approved alternatives. The EUAs COVID-19 medications include bamlanivimab, etesevimab, casirivimab, imdevimab, baricitinib and COVID-19 convalescent plasma. These drug moieties are used either as monotherapy or in combination. To a greater extent, therapeutic interventions for COVID-19 are geared towards symptomatic management and supportive therapy (e.g. IV fluids for adequate hydration, antipyretic agents and supplemental oxygen amongst others).

Preventive measures

Being at the peak of personal and food hygiene, reasonable distance from sick people, proper use of nose masks as well as staying hydrated amongst others is strongly recommended as preventive measures. Following the confirmed cases of COVID-19 in Nigeria, the price of nose masks has increased to a manifold. Many healthy people in low or no risk territories now use masks in attempt to prevent the virus. However, masks are to be used by symptomatic individuals, so if you are not coughing or sneezing, you don't need a mask. Appropriate use of medical mask is advised in COVID-19-prone areas. This entails not touching the outer part of worn mask which can trap respiratory droplets from infected persons as well as immediate and proper disposal of used masks.

Circulating myths

As earlier noted there are high purported treatment options and preventive measures circulating on the internet and could be misleading. For example, following the recommended use of alcohol-based hand wash or sanitizers (with the current prices in the Nigerian market having gone up), increased alcohol consumption has been advocated. This is totally false! While alcohol can be useful to disinfect surfaces, copious application on the body may irritate the skin and mucous membranes even resulting in injuries. Alcohol if consumed shouldn't be with the intent to treat or prevent COVID-19 and must be used in moderation to avoid alcohol intoxication with dire consequences on the liver, mental function and behavioural pattern.

Inappropriate and indiscriminate use of disinfectant

Though bleach (chlorine-based) disinfectant exerts biocidal effects on the SARS-CoV-2 on surfaces, drinking or applying these substances on the clothes or skin has little or no impact on the virus but may rather potentiate undesired outcomes including death.

Vitamin C kills SARS-CoV-2

Another myth is the advocacy of increased vitamin C intake (high dose), reasoning that, as an immune booster, there is no cold or flu it cannot cure. The fact remains that vitamins are used as supportive therapy, that is, they do not treat the underlying condition but increases the patient's comfort, boost immunity or provides relief. At low or therapeutic doses, vitamin C acts as an antioxidant. While at high doses, it is a pro-oxidant and thus, causes oxidative stress as well as a condition called hypervitaminosis C.

Garlic kills SARS-CoV-2

Furthermore, garlic has been purportedly reported to kill SARS-CoV-2. Following this, the price of garlic has exceedingly gone up in the south-south, south-east and south-western regions of Nigeria. Though garlic is a food spice with an array of nutritious and ethnopharmacological properties (e.g. antimicrobial) [26], there is no evidence from clinical trials or from the outbreak of COVID-19 showing that eating garlic or taking garlic supplements has protected people from being infected by SARS-CoV-2.

Use aluminium-magnesium silicate

Also, aluminium-magnesium silicate has been claimed to be effective against SARS-CoV-2. However, there are yet to be seen any published evidence from clinical trials to support such claims.

Myths surrounding COVID-19 vaccines

Following the advent of vaccines for the ravaging disease, numerous myths have been flooding the public domain. For instance, there has been a strong myth on social media and the internet that the COVID-19 vaccine can potentiate infertility in women. This generated a serious confusion suggesting that the spike protein on SARS-CoV-2 is identical or same as syncitin-1, another spike protein involved in the growth and attachment of the placenta during pregnancy. The false report said that getting a jab of the COVID-19 vaccine would prime the body to see the syncitin-1 spike protein as a foreign entity and thus potentiate a cascade of interactions that would negatively impact on fertility. However, the two spike proteins are completely different and distinct and being vaccinated against COVID-19 will not affect the fertility of women who are desirous of being pregnant, including through *in vitro* fertilization methods. Contrastingly, during the Pfizer vaccine tests, 23 volunteers (females of reproductive age) involved in the study became pregnant and the only one who suffered a pregnancy loss had not received the actual vaccine, but a placebo [27]. Currently, there is no evidence whatsoever linking COVID-19 vaccination to hindered and/or delayed gestation, including the development of the placenta or any structural and functional reproductive dysfunction both in men and women. Additionally, till date, there have been no reported antifertility adverse effects of any vaccine, including COVID-19 vaccines. Like all vaccines, continuous scientific studies as regards the safety of all COVID-19 vaccines are ongoing.

Vaccination causes COVID-19

Another erroneous assumption is that COVID-19 vaccine causes the coronavirus disease. For a fact, COVID-19 vaccine cannot and will not cause coronavirus disease. This is so because the vaccines do not contain the SARS-CoV-2 but only instructs the host cells to reproduce a protein that is part of SARS-CoV-2. If and when exposed, this protein helps the body's immune system to recognize and fight the virus head-on.

DNA alterations

Flooding the social media is the propaganda that COVID-19 vaccine changes the host DNA. This is said on the premise that once an individual is jabbed, the vaccine penetrates the cells and changes or modifies the person's DNA. Truth be told, the COVID-19 vaccines are designed to help the host immune system to fight the coronavirus. Undoubtedly, the two types of authorized COVID-19 vaccines (messenger RNA and viral vector vaccines) enter the cells, but not the nucleus of the cells where DNA resides. The mechanism of action of the mRNA vaccine prompt the cells to synthesize the specific protein needed to stimulate the immune system, after which it is rapidly degrades without interacting with the DNA. Since the genetic material from the vaccines does not gain access to the nucleus where the DNA localizes, any DNA interaction is impossible. In a nutshell, both mRNA and viral vector COVID-19 vaccines primarily prime the host cells to building protection against SARS-CoV-2. Rather than interact with the host DNA, all COVID-19 vaccines works in synergy with the body's natural defences to safely develop immunity to disease.

Dangerous adverse effects

As with all drugs, vaccines and medical devices, approved COVID-19 vaccines may have side effects, however, they are majorly short term and not serious or dangerous. Among the reported side effects are pain at the site of injection, fever, body pains and headaches lasting for a day or two. Immunopharmacologically, these are signs indicates that the vaccine is actively stimulating the immune system. However, in cases where these symptoms persist beyond two days, a doctor's appointment and consultation becomes essential. It is important to note that a rare potentially dangerous adverse event was recorded in some healthy volunteers that received the J&J/Janssen COVID-19 vaccine, which led to its temporary suspension by the CDC and FDA. Experts reviewing safety reports for this vaccine realized that a small number of women (majorly below 50 years old) who received this vaccine later developed thrombosis with thrombocytopenia syndrome (TTS) - a serious condition that involves blood clots with low platelets. As of now, a comparative review of all available data shows that the benefits (known and potential) of this vaccine outweigh its risks (known and potential). However, women younger than 50 years old should be conscious of this rare adverse event and should know that other COVID-19 vaccines are available.

Conclusion

In conclusion, facts and solidarity are imperative if we are to contain this public health emergency, COVID-19 but misinformation does no good than to further complicate the disease spread and outcome. As a norm, the practice of good personal and food hygiene, avoiding direct contact with sick people, proper use of medical mask and staying hydrated is strongly encouraged.

Conflict of Interest

All authors have no actual or potential competing financial interest to declare.

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