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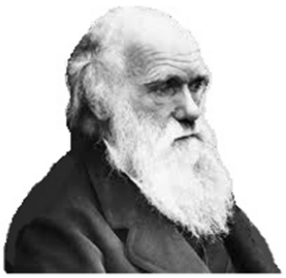

World News of Natural Sciences

An International Scientific Journal

WNOFNS 43 (2022) 38-59 EISSN 2543-5426

Coronavirus: The Hidden Truth

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ABSTRACT

Coronavirus is one of the most dangerous and contagious illnesses that arise from the introduction of host organisms into the biological system. As of March 2022, this sickness had caused more harm than good, with 479 million cases and 6.12 million deaths worldwide. These illnesses are unpredictable sources of social, financial, and economic distress. The rising incidence of infections is the most concerning aspect. Human coronaviruses were discovered in the 1960s using two distinct ways in the United Kingdom and the United States, while the first reports of coronavirus infection in animals occurred in the late 1920s when an acute respiratory infection of farmed hens developed in North America. Although some estimates place the common ancestor as far back as 55 million years or more, reflecting long-term co-evolution with bat and bird species, the most recent common ancestor (MRCA) of all coronaviruses is thought to have lived as recently as 8000 BCE. Coronaviruses have a single-stranded, positive-sense RNA genome that ranges in size from 26.4 to 31.7 kilobases. When the viral spike protein binds to its matching host cell receptor, infection occurs. There is no specific, effective, or 100 percent cure for coronavirus as of 2021, but supportive care, which includes treatment to relieve symptoms, fluid therapy, oxygen support, and prone positioning as needed, as well as medications or devices to support other affected vital organs, is the cornerstone of COVID-19 management.

***Keywords*:** Coronavirus, Covid-19, Spike protein, BioNTech

(Received 31 March 2022; Accepted 21 April 2022; Date of Publication 22 April 2022)

1. INTRODUCTION

The COVID-19 epidemic is today's main worldwide health calamity and the universe's greatest problem. COVID-19 is a type of encapsulated RNA virus that is found in both humans and animals. The virus is a member of the Nidovirales order, which includes the Roniviridae, Arteriviridae, and Coronaviridae families (Hassan et al., 2020; Shangal, 2020). Similarly, the Coronaviridae family is split into two groups: Torovirinae and Coronavirinae. The Coronavirinae family is further divided into alpha-, beta-, gamma-, and delta-COVs (Hassan et al., 2020). These viruses have a virus-related RNA genome that ranges from 26 to 32 kilobases in size, allowing them to be isolated from a variety of animal species. The coronaviruses can also be observed under an electron microscope because they have a crown-like appearance. In an ideal world, the disease's widespread dissemination and related health hazards would make it a vital pathogen. Human coronaviruses are primarily connected to modest clinical signs. Simultaneously, the World Health Organization (WHO) has conducted studies and laboratory research in order to identify the new COV strain, COVID-19 (Anjorin et al., 2020). The disease-causing virus, on the other hand, was dubbed the SARS-CoV-2 virus by the International Committee on Virus Taxonomy. As a result of how the disease passed from person to person, it has become a public health concern (Wang, 2020). COVID - 19 is particularly transmissible in this situation, necessitating a thorough understanding of the disease's epidemiology, transmission, clinical aspects, diagnosis, therapy, and prevention. Furthermore, the coronavirus is a member of a virus family that can produce a variety of symptoms including pneumonia, fever, difficulty breathing, and lung infection (Wuhan Municipal Health, 2020). On December 29, 2019, the World Health Organization (WHO) coined the term "2019 novel coronavirus" to describe a coronavirus that infected the lower respiratory tract of pneumonia patients in Wuhan, China (Li et al., 2020). The official name of the 2019 novel coronavirus is coronavirus illness (COVID-19), according to the WHO (WHO, 2020). The virus's official name is severe acute respiratory syndrome coronavirus 2 at the moment (SARS-CoV-2). In December 2019, a cluster of pneumonia patients with an unknown origin was linked to a local Huanan South China Seafood Market in Wuhan, Hubei Province, China (Zhu *et al.*, 2019). The past, present, and future of the deadly coronavirus will be discussed in this overview.

2. HISTORICAL BACKGROUND OF CORONAVIRUS

The first animal cases of coronavirus infection were reported in the late 1920s, when an acute respiratory infection in farmed hens was discovered in North America (Estola, 1970). In 1931, Arthur Schalk and M.C. Hawn published the first complete report on a novel chicken respiratory ailment in North Dakota. Gasping and listlessness were common symptoms of infection in new-born chicks, with mortality rates of 40–90 percent (Fabricant, 1998). The virus that caused the sickness was discovered in 1933 by Leland David Bushnell and Carl Alfred Brandly (Bushnell, 1933). Infectious bronchitis virus was the name given to the virus at the time (IBV). In 1937, Charles D. Hudson and Fred Robert Beaudette were the first to grow the virus (Decaro, 2011). The Beaudette strain was named after the specimen. JHM, which causes brain disease (murineen cephalitis), and mouse hepatitis virus (MHV), which causes hepatitis in mice, were discovered in the late 1940s (MIcintosh, 1974). The connection between these three viruses was not known at the time.

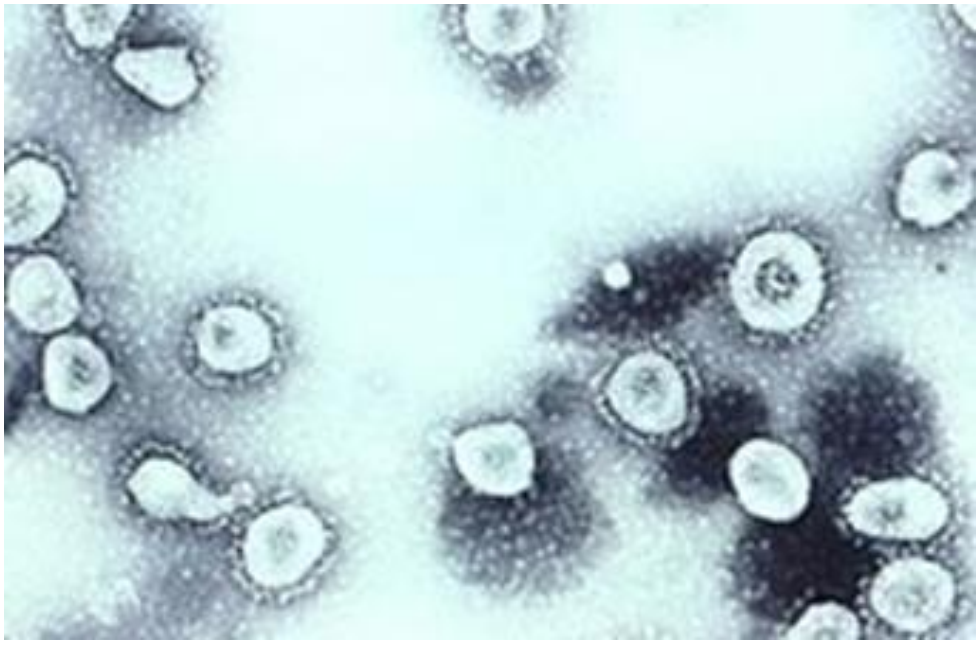

Figure 1. Transmission electron micrograph of organ cultured coronavirus OC43

Human coronaviruses were discovered in the United Kingdom and the United States in the 1960s using two separate approaches (Monto, 1984). In 1961, E.C. Kendall, Malcolm Bynoe, and David Tyrrell of the British Medical Research Council's Common Cold Unit collected a unique common cold virus known as B814 for the British Medical Research Council's Common Cold Unit (Kendall et al., 1962; Richmond, 2005). The virus could not be grown using ordinary approaches that had previously been successful in growing rhinoviruses, adenoviruses, and other common cold viruses. Tyrrell and Bynoe successfully cultured the new virus in 1965 by serially passing it through human embryonic trachea organ culture (Tyrell et al., 1965). Bertil Hoorn was the one who introduced the novel cultivation method to the lab. When intranasally implanted into volunteers, the isolated virus induced a cold and was inactivated by ether, indicating that it possessed a lipid envelope (Kendall et al., 1962; Hagan et al., 1988). In 1962, medical students Dorothy Hamre and John Procknow from the University of Chicago isolated a new cold. They identified the virus as 229E after isolating it and growing it in kidney tissue culture. In volunteers, the novel virus caused a cold and, like B814, was inactivated by ether (Hamre et al., 1966; Sadniman et al., 20220; Adeyemi, 2021).

3. CLASSIFICATION OF CORONAVIRUS

Coronaviruses belong to the *Orthocoronavirinae* subfamily (Fan et al., 2019), one of two in the *Coronaviridae* family, order *Nidovirales*, and kingdom Riboviria (de-Groot et al., 2011; Wertheim *et al.*, 2013). *Alphacoronavirus*, *Betacoronavirus*, *Gammacoronavirus*, and *Deltacoronavirus* are the four genera in which they are classified. Animals are infected by *Alphacoronaviruses* and *Betacoronaviruses*, whereas birds are infected by *Gammacoronaviruses* and *Deltacoronaviruses* (Wertheim et al., 2013).

Genus: *Alphacoronavirus* (Decaro, 2011); type species: *Alphacoronavirus* 1 Species: *Alphacoronavirus* 1 (TGEV, *Felinecoronavirus*, *Canineco*ronavirus), *Humancoronavirus* 229E, Human coronavirus NL63, Miniopterus bat coronavirus 1, Miniopterusbatcoronavirus HKU8, Porcine epidemic diarrheavirus, Rhinolophus batcoronavirus HKU2, Scotophilusbatcoronavirus 512,

Genus: *Betacoronavirus* (Decaro, 2011); type species: Murinecoronavirus (MHV) Species: Betacoronavirus 1 (Bovine Coronavirus, Humancoronavirus OC43), Hedgehogcoronavirus1, Humancoronavirus HKU1, Middle East respiratory syndrome-related coronavirus, Murinecoronavirus, Pipistrellus bat coronavirus HKU5, Rousettus bat coronavirus HKU9, Severe acute respiratory syndrome-related coronavirus (SARS-CoV, SARS-CoV-2), Tylonycteris bat coronavirus HKU4

Genus: *Gammacoronavirus* (Decaro, 2011); type species: Aviancoronavirus (IBV) Species: Avian coronavirus, Belugawhale coronavirus SW 1

Genus: *Deltacoronavirus*; type species: Bulbulcoronavirus HKU11 Species: Bulbulcoronavirus HKU11, Porcine coronavirus HKU15
Origin of Coronavirus

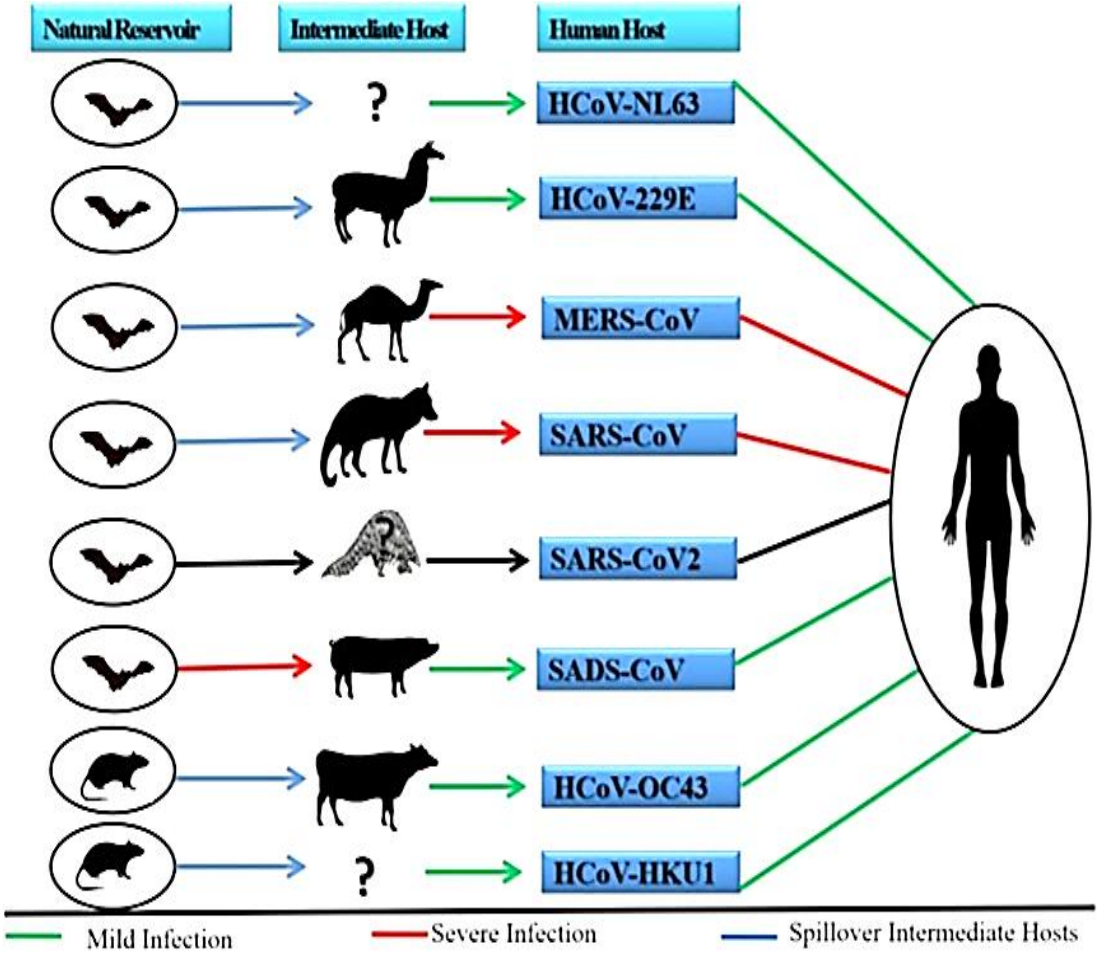

Figure 2. Origin of Coronavirus

Although some theories place the common ancestor as far back as 55 million years or more, the most recent common ancestor (MRCA) of all coronaviruses is estimated to have existed as recently as 8000 BCE, implying long-term co-evolution with bat and bird species (Wertheim et al., 2013). The alphacoronavirus line's most recent common ancestor was around 2400 BCE, the *Betacoronavirus* line around 3300 BCE, the *Gammacoronavirus* line around 2800 BCE, and the *Deltacoronavirus* line around 3000 BCE. Bats and birds are suitable natural reservoirs for the coronavirus gene pool since they are warm-blooded flying animals (with bats the reservoir for *Alphacoronaviruses* and *Betacoronavirus* and birds the reservoir for *Gammacoronaviruses* and *Deltacoronaviruses*). Coronaviruses have evolved and spread widely due to the enormous number and diversity of bat and bird species that host them (Woo et al., 2012).

Bats are the source of several human coronaviruses (Fomi et al., 2017). Between 1190 and 1449 CE, the human coronavirus NL63 had a common ancestor with a bat coronavirus (ARCoV.2) (Huynh et al., 2012). Between 1686 and 1800 CE, the human coronavirus 229E had a common ancestor with a bat coronavirus (Ghana Grp1 Bt CoV) (Pfefferle et al., 2009). More recently, before 1960, alpaca coronavirus and human coronavirus 229E diverged (Croosley et al., 2012). MERS-CoV spread from bats to people via camels as an intermediate host (Fomi et al., 2017).

MERS-CoV appears to have split from numerous bat coronavirus species some centuries ago, despite being linked to them (Lau et al., 2013). In 1986, the most closely related bat coronavirus and SARS-CoV separated (Vijaykrishna et al., 2007). SARS-ancestors CoV's first infected leaf-nose bats of the genus Hipposideridae, then progressed to horseshoe bats of the species Rhinolophidae, Asian palm civets, and finally humans (Gouilh et al., 2011; Cui et al., 2007).

3. BIOCHEMISTRY OF CORONAVIRUS

Genome of coronavirus

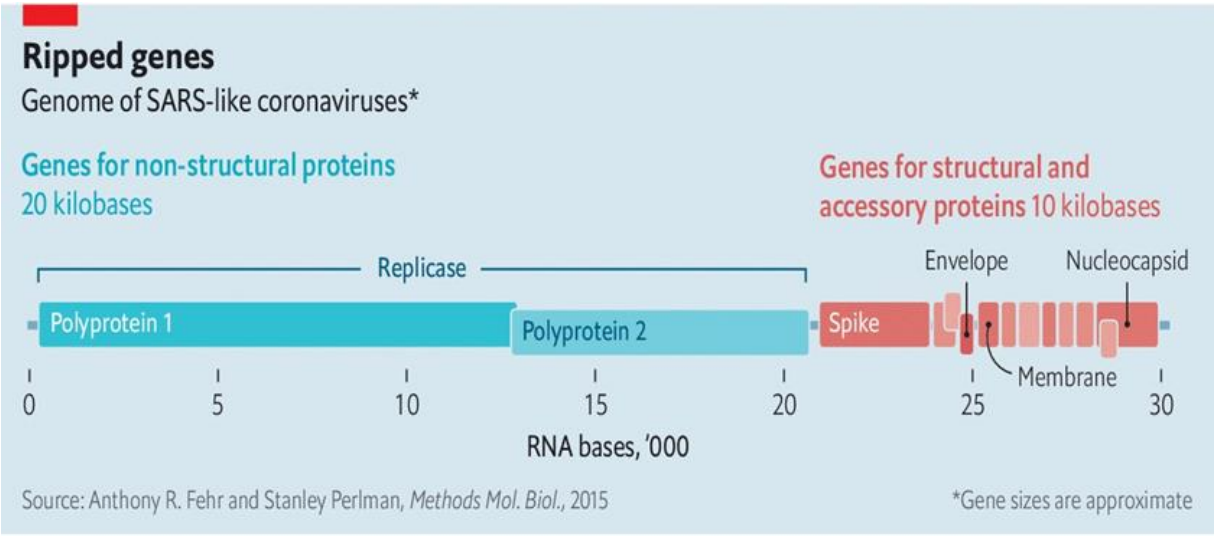

Figure 3. SARS-CoV2 genome and protein (Anthony et al., 2015)

Coronaviruses have a single-stranded, positive-sense RNA genome. Coronavirus genomes range in size from 26.4 to 31.7 kilobases (Woo et al., 2010). Among RNA viruses, it has one of the largest genomes. A 5′ methylated cap and a 3′ polyadenylated tail are present in the genome (Fehr, 2015). A coronavirus' genome is organized as follows: 5′-leader-UTR-replicase (ORF1ab)-spike (S)-envelope (E)-membrane (M) -poly (A) tail -nucleocapsid (N)-3′UTR. The replicase polyprotein is encoded by the open reading frames 1a and 1b, which occupy the first two-thirds of the genome (pp1 ab). Self-cleavage of the replicase polyprotein results in the formation of 16 nonstructural proteins (nsp1–nsp16) (Fehr, 2015). The four key structural proteins are encoded in the later reading frame: spike, envelope, membrane, and nucleocapsid (Snijder *et al.*, 2003). The reading frames for auxiliary proteins are interspersed between these reading frames. Depending on the coronavirus, the number of accessory proteins and their functions vary (Fehr, 2015).

Structure of coronavirus

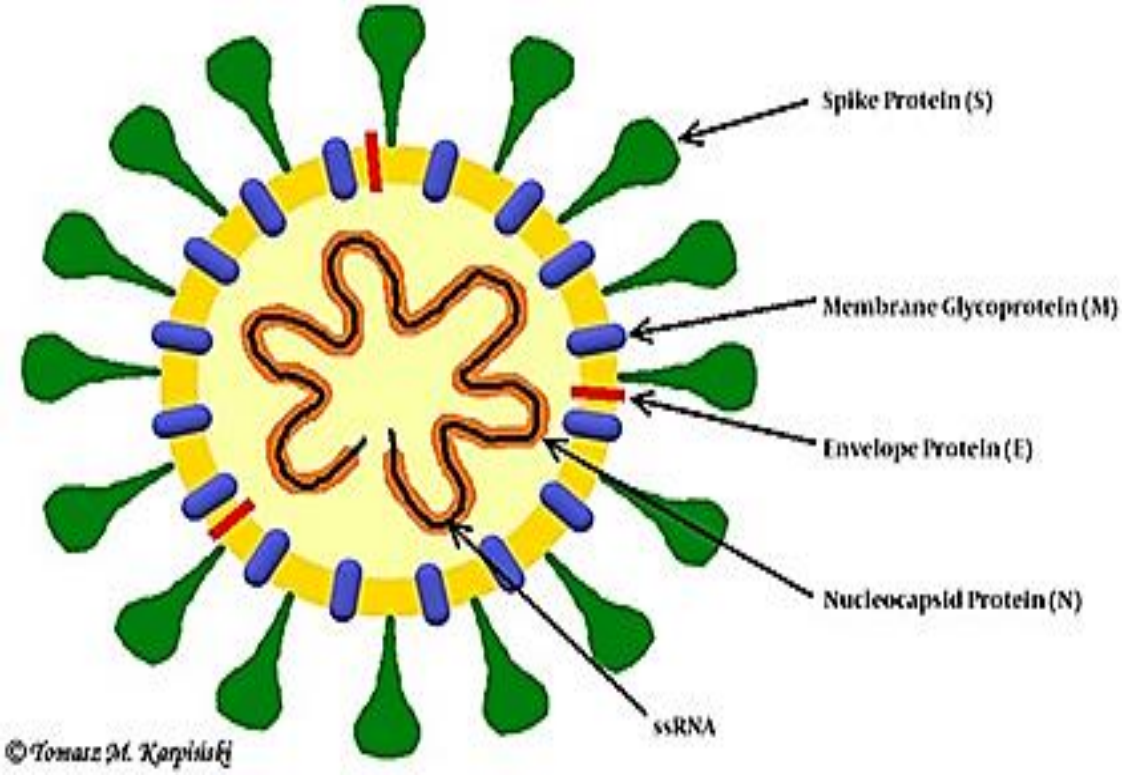

Figure 4. Cross-sectional model of a coronavirus

Coronaviruses are spherical, big particles with distinct surface projections (Goldsmith et al., 2004). Their size varies greatly, with average sizes ranging from 80 to 120 nanometers. Extreme sizes ranging from 50 to 200 nm in diameter have been seen (Masters, 2006). On average, the total molecular weight is 40,000 kDa. They're encased in a package containing a number of protein molecules (Lalchhandama, 2020). When the virus is outside the host cell, it is protected by the lipid bilayer envelope, membrane proteins, and nucleocapsid (Neuman et

al., 2011). The membrane (M), envelope (E), and spike (S) structural proteins are anchored in a lipid bilayer that makes up the viral envelope (Lai, 1997). In the lipid bilayer, the E: S: M ratio is roughly 1:20:300 (Cavanagh et al., 2001). The structural proteins E and M work along with the lipid bilayer to shape and maintain the viral envelope's size (Fehr, 2015). Interaction with the host cells necessitates the use of S-proteins. The M-protein of the human coronavirus NL63, rather than the S-protein, has the binding site for the host cell (Naskalska et al.,2019). The envelope's diameter is 85 nanometers. In electron micrographs, the virus's envelope appears as a unique pair of electron-dense shells (shells that are relatively opaque to the electron beam used to scan the virus particle) (Neuman et al., 2006).

The corona- or halo-like surface is caused by the spikes, which are the most defining feature of coronaviruses. A coronavirus particle contains an average of 74 surface spikes (Neuman et al., 2011). Each spike is around 20 nm long and made up of three S-protein trimers. The S-protein is made up of two subunits: S1 and S2. The homotrimeric S-protein is a class I fusion protein that facilitates virus-host cell receptor interaction and membrane fusion. The S1 subunit is the spike's head and contains the receptor-binding domain (RBD). The S2 subunit creates the stem that secures the spike in the viral envelope and allows fusion during protease activation. As they are exposed on the viral surface, the two subunits remain non-covalently connected until they bind to the host cell membrane (Lalchhandama, 2020). Three S1 subunits are linked to two S2 subunits in a functionally active state. When the virus attaches and fuses with the host cell, proteases such as cathepsin family and transmembrane protease serine 2 (TMPRSS2) of the host cell separate the subunit complex into individual subunits (Alsaadi, 2019).

4. REPLICATION CYCLE OF CORONAVIRUS

Cell entry

When the viral spike protein binds to its matching host cell receptor, infection occurs. The receptor-attached spike protein is cleaved and activated by a protease in the host cell after attachment. Cleavage and activation allow the virus to enter the host cell via endocytosis or direct fusing of the viral envelope with the host membrane, depending on the host-cell protease available (Simmons et al., 2013).

Genome translation

The virus particle is uncoated when it penetrates the host cell, and its genome enters the cytoplasm. The coronavirus RNA genome has a 5′-methylated cap and a 3′-polyadenylated tail, allowing it to function as a messenger RNA and be translated directly by the ribosomes of the host cell. The virus's first overlapping open reading frames ORF1 a and ORF1 b are translated by the host ribosomes into two enormous overlapping polyproteins, pp1 a and pp1 ab (Fehr, 2015). A ribosomal frameshift triggered by a slippery sequence (UUUAAAC) and a downstream RNA pseudoknot at the end of open reading frame ORF1a results in the bigger polyprotein pp1 ab (Masters, 2006). The ribosomal frameshift permits ORF1 a to be translated continuously after ORF1 b (Fehr, 2015).

PLpro (nsp3) and 3CLpro (nsp5) are polyprotein-specific proteases that cleave the polyproteins at various particular locations. Polyprotein (pp1ab) cleavage produces 16 nonstructural proteins (nsp1 to nsp16). RNA-dependent RNA polymerase (nsp12), RNA

helicase (nsp13), and exoribonuclease (nsp14) are among the replication proteins produced (Fehr, 2015).

Replicase-transcriptase

A multi-protein replicase-transcriptase complex is formed when a number of nonstructural proteins come together. The RNA-dependent RNA polymerase is the most important replicase-transcriptase protein (RdRp). It takes part in the replication and transcription of RNA from an RNA strand directly. The complex's other nonstructural proteins aid in the replication and transcription processes. For example, the exoribonuclease nonstructural protein adds replication fidelity by providing a proofreading function that the

RNA-dependent RNA polymerase lacks (Sexton et al., 2016).

One of the complex's most important roles is to reproduce the viral genome. The production of negative-sense genomic RNA from positive-sense genomic RNA is mediated by RdRp directly. The replication of positive-sense genomic RNA from negative-sense genomic RNA follows (Fehr, 2015).

The complex also has another crucial function: it transcribes the viral DNA. From positive-sense genomic RNA, RdRp directly mediates the synthesis of negative-sense subgenomic RNA molecules. The transcription of these negative-sense subgenomic RNA molecules to their corresponding positive-sense mRNAs follows this pattern (Fehr, 2015). The subgenomic mRNAs are organized into a "nested set" with a shared 5' head and a largely duplicated 3' end (Payne, 2017).

When at least two viral genomes are present in the same infected cell, the replicase-transcriptase complex is capable of genetic recombination (Payne, 2017). RNA recombination appears to be a major driving force in determining genetic variability within coronavirus species, a coronavirus species' ability to jump from one host to another, and, in many cases, the emergence of novel coronaviruses (Su et al., 2016). The specific process of coronavirus recombination is unknown; however it is thought to include template witching during genome replication (Su et al., 2016).

Assembly and release

The progeny viruses' genome is made up of the replicated positive-sense genomic RNA. After the initial overlapping reading frame, the mRNAs are gene transcripts from the last third of the virus genome. These mRNAs are translated into structural proteins and a variety of auxiliary proteins by the host's ribosomes (Fehr, 2015). The endoplasmic reticulum is where RNA translation takes place. The viral structural proteins S, E, and M migrate into the Golgi intermediate compartment via the secretory pathway. Following their attachment to the nucleocapsid, the M-proteins guide the majority of protein-protein interactions essential for viral assembly. Exocytosis releases the progeny viruses from the host cell via secretory vesicles. The viruses can infect other host cells once they've been discharged (Fehr, 2015).

Transmission

Viruses can be transmitted into the environment by infected carriers. The coronavirus spike protein's interaction with its complementary cell receptor is crucial in determining the released virus's tissue tropism, infectivity, and species range (Masters, 2006; Cui et al., 2009). Coronaviruses are mostly interested in epithelial cells (de-Groot et al., 2011). Depending on the

coronavirus species, they can be transmitted from one host to another via aerosol and fomite or the fecal-oral pathway (Decaro, 2011). Animal coronaviruses primarily infect the epithelial cells of the digestive tract, whereas human coronaviruses infect the epithelial cells of the respiratory tract (de-Groot et al., 2011). By attaching to the angiotensin-converting enzyme 2 (ACE2) receptors, the SARS coronavirus, for example, infects human epithelial cells in the lungs via aerosol (Li et al., 2005). By attaching to the alanine aminopeptidase (APN) receptor, the transmissible gastroenteritis coronavirus (TGEV) infects pig epithelial cells of the digestive system via a fecal-oral pathway (Decaro, 2011; Fehr, 2015).

Infection of Coronavirus in Living System Infection in human

Coronaviruses have a wide range of risk factors. Some, like MERS-CoV, can kill up to 30% of individuals infected, while others, like the common cold, are quite innocuous. Coronaviruses can produce serious cold symptoms including fever and a painful throat caused by swollen adenoids (Liu et al., 2017). Pneumonia (either direct viral pneumonia or secondary bacterial pneumonia) and bronchitis (either direct viral bronchitis or secondary bacterial bronchitis) are both caused by coronaviruses (Forgie, 2009). SARS- MCoV, a human coronavirus identified in 2003 that causes severe acute respiratory syndrome (SARS), has a unique pathophysiology in that it causes infections in both the upper and lower respiratory tracts (Forgie, 2009). There are six species of human coronaviruses, with one species subdivided into two strains, for a total of seven strains of human coronaviruses.
Despite the fact that they may have been more aggressive in the past, four human coronaviruses produce symptoms that are generally moderate (King, 2020):

Human coronavirus OC43 (HCoV- OC43), β-CoV

Human coronavirus HKU1 (HCoV- HKU1), β-CoV

Human coronavirus 229E (HCoV-229E), α-CoV

Human coronavirus NL63 (HCoV-NL63), α-CoV

Three human coronaviruses produce symptoms that are potentially severe:

Middle East respiratory syndrome-related coronavirus (MERS-CoV), β- CoV Severe acute respiratory syndrome coronavirus (SARS-CoV), β-CoV Severe acute respiratory syndrome coronavirus 2 (SARS- CoV- 2), β-CoV.

Signs and Symptoms of coronavirus

COVID-19 symptoms range from mild to severe, depending on the severity of the infection (Grant et al., 2020). Headache, loss of smell and taste, nasal congestion and rhinorrhea, cough, muscle discomfort, sore throat, fever, and breathing difficulties are all common symptoms (European Center for Disease Prevention, 2020). People with the same virus may experience a variety of symptoms, which may change over time. Loss of taste mixed with loss of smell is related with COVID-19 with a 95 percent specificity in persons without antecedent ear, nose, and throat problems (Benezit et al., 2020). The majority of patients (81%) experience mild to moderate symptoms (up to mild pneumonia), whereas 14 percent experience severe symptoms (dyspnoea, hypoxia, or more than 50% lung involvement on imaging), and 5% experience critical symptoms (respiratory failure, shock, or multiorgan dysfunction) (CDC, 2020). Around one out of every five persons is infected with the virus, yet they never show any

symptoms (Nogrady, 2020; Gao et al., 2020). According to a June 2020 study, asymptomatic infections could be as high as 40 to 45 percent, with the ability to transmit the virus for up to two weeks (Oran et al., 2020). Asymptomatic carriers are less likely to get tested, and they can transfer the disease to others (Lai et al., 2020). Other infected people will acquire symptoms later (known as pre-symptomatic) or with very weak symptoms, and the virus will spread as a result (Furukawa et al., 2020).

Figure 5. Human suffering from Covid-19 symptoms

As is common with infections, there is a period of time between when a person becomes infected and when the first symptoms occur, known as the incubation period. COVID-19 has a four to five-day incubation time on average (Gandhi et al., 2020). The majority of symptomatic people develop symptoms two to seven days after exposure, and almost everyone develops one or more symptoms by day twelve (Wiersinga et al., 2020).

Infection in animals

Coronaviruses have been recognized in veterinary medicine as generating pathogenic diseases since the 1930s (Mclntosh, 1974). Swine, cattle, horses, camels, cats, dogs, rodents, birds, and bats are among the animals infected. The majority of coronaviruses seen in animals infect the intestinal system and are spread via a fecal-oral pathway (Murphy et al., 1999). Virologists interested in veterinary and zoonotic diseases have devoted a lot of time and effort to deciphering the viral pathophysiology of these animal coronaviruses (Tirottha et al., 2010).

Farm animals

Domesticated birds are infected by coronaviruses. Avian infectious bronchitis is caused by the infectious bronchitis virus (IBV), a coronavirus (Bande et al., 2015). The virus is a source of concern for the poultry industry due to the high mortality rate associated with infection, as well as its quick dissemination and impact on productivity. The virus has a negative impact on both meat and egg production, resulting in significant financial losses (Cavanagh, 2007).

In hens, the infectious bronchitis virus attacks both the respiratory and urogenital tracts. The virus has the ability to spread to several organs throughout the chicken (Bande et al., 2015).

The virus is spread via aerosol and feces-contaminated food. IBV vaccines are available and have helped to keep the virus and its variants under control. The virus that causes infectious bronchitis is one of several strains of the Avian coronavirus species. Turkey coronavirus (TCV) is another avian coronavirus strain that causes enteritis in turkeys.

Other aspects of animal husbandry, such as pig farming and cow raising, are also affected by coronaviruses. The pigs get diarrhea from the swine acute diarrhea syndrome coronavirus (SADS-CoV), which is related to the bat coronavirus HKU2 (Zhou et al., 2018). PEDV (Porcine Epidemic Diarrhea Virus) is a newly discovered coronavirus that causes diarrhea in pigs (Wei et al., 2020).

Another coronavirus that causes diarrhea in young pigs is the transmissible gastroenteritis virus (TGEV), which belongs to the Alphacoronavirus 1 species (www.ncbi.nlm.nih.gov) (Cruz et al., 2013). Bovine coronavirus (BCV), a member of the species *Betacoronavirus* 1 and related to HCo-OC43 (www.ncbi.nlm.nih.gov), causes severe profuse enteritis in young calves in the cattle sector.

Laboratory animals

Laboratory animals are infected with coronaviruses. Mouse hepatitis virus (MHV), a member of the Murine coronavirus family (www.ncbi.nlm.nih.gov), produces an epidemic murine sickness with a high fatality rate, particularly in laboratory mouse colonies (Weiss et al., 2005). MHV was the best-studied coronavirus in vivo and in vitro, as well as at the molecular level, prior to the discovery of SAR-CoV. In mice that have been used as a model for multiple sclerosis, some strains of MHV induce a progressive demyelinating encephalitis (Titotta et al., 2010). The highly infectious coronavirus Sialodacryo adenitis virus (SDAV), which is a strain of the genus Murine coronavirus, can be spread between persons by direct touch or indirectly by aerosol. In young European rabbits, the rabbit enteric coronavirus causes acute gastrointestinal illness and diarrhea.

The real-time reverse transcription polymerase chain reaction (rRT-PCR), which identifies the presence of viral RNA fragments, is the standard method of testing for the presence of SARS-CoV-2 (CDC, 2020). (WHO, 2020). The capacity to predict the length of infectivity of patients is restricted (Bullard et al., 2020) since this test detects RNA but not infectious virus. The test is usually performed on respiratory samples acquired by a nasopharyngeal swab, although it can also be performed on a nasal swab or a sputum sample (CDC, 2020). In most cases, results are available within a few hours to two days (Brueck, 2020). Blood tests can be done, but they require two blood samples separated by two weeks, and the results aren't useful right away.

The World Health Organization (WHO) has released various illness testing procedures (WHO, 2020). CT scans of the chest may be useful in diagnosing COVID-19 in people who have a strong clinical suspicion of infection, but they are not suggested for routine screening (Salehi et al., 2020).

Early infection is characterized by bilateral multilobar ground-glass opacities with a peripheral, asymmetric, and posterior distribution (Pormohammad et al., 2020). As the disease advances, subpleural dominance, crazy paving (lobular septal thickening with varying alveolar filling), and consolidation may emerge (Lee et al., 2020). Asymmetric peripheral ground-glass opacities without pleural effusions are common imaging findings on chest radiographs and computed tomography (CT) of persons who are symptomatic (Li, 2020).

Prevention of Coronavirus

Staying at home, wearing a mask in public, avoiding crowded places, keeping a safe distance from others, ventilating indoor spaces, washing hands with soap and water frequently and for at least 20 seconds, practicing good respiratory hygiene, and avoiding touching the eyes, nose, or mouth with unwashed hands are all preventive measures (CDC, 2020). The CDC advises those who have been diagnosed with COVID-19 or suspect they may be infected to stay at home unless they need medical attention, call ahead before visiting a healthcare provider, wear a facemask before entering the healthcare provider's office and when in any room or vehicle with another person, cover coughs and sneezes with a tissue, wash hands frequently with soap and water, and avoid sharing personal household items (CDC, 2020).

The first COVID-19 vaccination was approved by the UK Medicines and Healthcare Products Regulatory Agency (MHRA) on December 2nd (Medicine and Healthcare Products Regulatory Agency, 2020). The US Food and Drug Administration (FDA) assessed it for emergency use authorisation (EUA) status, as well as in several other countries (Benjamin, 2020). Outside of a clinical trial, the US National Institutes of Health guidelines do not advocate any medicine for COVID-19 prophylaxis before or after exposure to the SARS-CoV-2 virus (NIH, 2020; Sanders et al., 2020). Without a vaccine, other preventative measures, or effective therapies, one of the most important aspects of COVID-19 management is attempting to reduce and delay the epidemic peak, a process called "flattening the curve" (Anderson et al., 2020). This is accomplished by decreasing the rate of infection to reduce the risk of overburdening health facilities, allowing for better treatment of existing patients, and postponing new instances until effective treatments or a vaccine become available (Wiles, 2020).

Treatment of Coronavirus

The condition produced by the SARS-CoV-2 virus, coronavirus disease 2019 (COVID-19), has no specific, effective therapy or cure (Siemieniuk et al., 2020). Supportive care, which includes treatment to ease symptoms, fluid therapy, oxygen support, and prone positioning if needed, as well as drugs or devices to assist other afflicted essential organs, is the cornerstone of COVID-19 management (Fisher, 2020; Liu et al., 2020; Wang et al., 2020). The majority of COVID-19 instances are minor. Supportive therapy in these cases comprises medicines such as paracetamol or NSAIDs to ease symptoms (fever, body pains, and cough), enough fluid intake, rest, and nasal breathing (Wang et al., 2020; Martel et al., 2020). A healthy diet and good personal cleanliness are also encouraged (Clinical Research, 2020). Those who fear they have the virus should isolate themselves at home and wear a face mask, according to the US Centers for Disease Control and Prevention (CDC) (CDC, 2020). People with more serious cases may require hospitalization. The glucocorticoid dexamethasone is strongly advised for patients with low oxygen levels, as it can lower the risk of mortality (National Covid-19 Clinical Evidence Task force, 2020). To maintain breathing, noninvasive ventilation and, eventually, admission to an intensive care unit for mechanical ventilation may be required. ECMO (extracorporeal membrane oxygenation) has been used to treat respiratory failure, although its merits are still being debated (Guan et al., 2020; Henry, 2020).

Clinical studies are now being conducted on a number of investigational treatments (Siemieniuk et al., 2020). Others, including as hydroxychloroquine and lopinavir/ritonavir, were thought to be promising early in the epideic, but later studies proved them to be useless or even hazardous (Kim et al., 2020; NIH, 2020). Despite the increasing study, there is yet

insufficient high-quality evidence to support the recommendation of so-called early treatment. Nonetheless, two monoclonal antibody-based treatments are available in the United States for early use in instances that are deemed to be at high risk of progressing to severe disease (NIH, 2020). The antiviral remdesivir is available with varying restrictions in the United States, Canada, Australia, and several other countries; however, it is not recommended for people who require mechanical ventilation, and the World Health Organization (WHO) (Hsu, 2020) discourages it entirely due to limited evidence of its efficacy (Siemieniuk et al., 2020).

Vaccines

The majority of promising covid-19 vaccines were created using the monoclonal antibody approach, in which the virus's spike protein is injected into the host system to inform it of antigen and interact with the system antibody to protect the host against the pathogen when it is encountered (Cyprus Medical School, 2020). There were 69 vaccine candidates in clinical development by January 2021, with 43 in Phase I–II trials and 26 in Phase II–III trials (Vaccine Center, London School of Hygiene, 2020). Several COVID-19 vaccines showed efficacy of up to 95% in preventing symptomatic COVID-19 infections in Phase III trials. At least one national regulatory authority had approved nine vaccines for public use as of January 2021: two RNA vaccines (the Pfizer-BioNTech vaccine and the Moderna vaccine), three conventional inactivated vaccines (BBIBP-CorV from Sinopharm, BBV152 from Bharat Biotech and CoronaVac from Sinovac), two viral vector vaccines (Sputnik V from the Gamaleya Research Institute and the Oxford–AstraZeneca vaccine), and one peptide vaccine ((EpiVacCorona[ru]). Many countries have devised staggered distribution programs that prioritize people who are most at risk of difficulties, such as the elderly, as well as those who are most at risk of exposure and transmission, such as healthcare personnel (Beaumont, 2020). According to official statistics from national health organizations, 32.64 million doses of COVID19 vaccination had been provided worldwide as of 14 January 2021. In 2021, Pfizer, Moderna, and AstraZeneca forecast a manufacturing capacity of 5.3 billion doses, enough to vaccinate around 3 billion individuals (due to the vaccines' two-dose requirement for protection against COVID19). By December, countries had preordered more than 10 billion vaccine doses (Mullard, 2020), with high-income countries purchasing about half of the doses although accounting for only 14% of the world's population (So *et al*., 2020).

5. IMPACT OF CORONAVIRUS TO THE SOCIETY

Supply shortage

The outbreak has been blamed for several supply shortages, which have resulted from the increased global use of equipment to combat outbreaks, panic buying (which has resulted in shelves being cleared of grocery essentials such as food, toilet paper, and bottled water in several locations), and disruptions to factory and logistic operations (Tkyo, 2020). The perceived threat, perceived scarcity, dread of the unknown, coping behavior, and social psychological elements (e.g. social influence and trust) have all been linked to the spread of panic buying (Yuen et al., 2020). Shipments of electronic items are expected to be delayed, according to the technology industry (Strumpf, 2020). According to WHO Director-General Tedros Adhanom, demand for personal protective equipment has increased by a factor of a hundred, resulting in costs up to twenty times the typical price and four to six-month delays in

the delivery of medical supplies (Nebehay, 2020; Boseley, 2020). It has also resulted in a global scarcity of personal protective equipment, with the WHO warning that this will put health workers in danger (WHO, 2022).

Environment and climate

The pandemic's global disruption has had a variety of environmental and climate-related consequences. Anthropause (Rutz et al., 2020) refers to a global reduction in modern human activity, such as a significant decrease in scheduled travel (Team, 2020). This has resulted in significant reductions in air and water pollution in many locations (Venter et al., 2020). Lockdowns and other steps in China resulted in a 25% drop in carbon emissions (Myllyvirta, 2020) and a 50% reduction in nitrogen oxide emissions (Zhang et al., 2020), saving at least 77,000 lives over two months, according to one Earth systems scientist (Burke, 2020; McMahan, 2020). Other environmental benefits include governance-system-controlled investments in a sustainable energy transition and other environmental goals, such as the European Union's seven-year €1 trillion budget proposal and €750 billion recovery plan "Next Generation EU," which aims to set aside 25% of EU spending for climate-friendly spending (Simon, 2020; Carpenter, 2020). However, the outbreak has provided cover for illegal activities such as deforestation of the Amazon rain forest and poaching in Africa (CNBC, 2020), hampered environmental diplomacy efforts (Climate Home News, 2020), and caused economic fallout, which some predict will slow investment in green energy technologies (CNBC, 2020; Newburger, 2020).

Agriculture and food system

The COVID-19 pandemic has wreaked havoc on the world's agricultural and food systems (FAO, 2020). COVID-19 arrived at a time when global hunger and malnutrition were once again on the rise, with an estimated 690 million people being hungry in 2019. (FAO, 2002). According to the latest UN predictions, the pandemic's economic downturn will cause another 83 million people to be hungry in 2020, with the number rising to as high as 132 million (Daventry, 2020). This is primarily due to a lack of food access, which is linked to lower wages, lost remittances, and, in some situations, higher food prices. In countries where extreme food insecurity already exists, the issue is rapidly becoming one of food production rather than just access to food (FAO, 2020). The pandemic, along with lockdowns and travel restrictions, has stymied assistance delivery and harmed food production. As a result, many famines are expected, which the UN has dubbed a "biblical-scale calamity" or "hunger pandemic." Without intervention, it is anticipated that 30 million people will go hungry, with Oxfam estimating that "12,000 people per day could die from COVID-19-related hunger" by the end of 2020. (Fiona Harvey Envirionment, 2020).

Education

The epidemic has had a significant impact on educational systems around the world. The majority of governments have temporarily closed educational institutions, with many people opting for online learning. As of September 30, 2020, roughly 1.077 billion students are affected by school closures as a result of the pandemic. According to UNICEF, 53 nations are currently conducting national closures, while 27 are undertaking local closures, affecting 61.6 percent of the global student population. There are now 72 schools open in 72 countries (UNESCO, 2020).

School closures have far-reaching economic and societal effects, not just for kids, teachers, and families. Student debt, digital learning, food hardship, and homelessness, as well as access to childcare, health care, housing, the internet, and disability services, have all been highlighted as a result of school closures in reaction to the pandemic. For impoverished children and their families, the impact has been more severe, creating disruptions in learning, poor nutrition, childcare issues, and a financial cost to families who are unable to work.

Research on Coronavirus

COVID-19 is being studied to learn more about its transmissibility, severity, and other characteristics (Li et al., 2020). The majority of the early cases appear to have had some type of connection to the original seafood market (Zhou et al., 2020). Human-to-human transmission by intimate contact was soon discovered to represent a secondary source of infection. There was an upsurge in the number of afflicted people who had never been exposed to animals or visited Wuhan, and there were many occurrences of infection among medical professionals (Liu et al., 2020; Huang et al., 2020). It was discovered that COVID-19 infection develops as a result of virus exposure and that both immunocompromised and healthy people are vulnerable. Adult patients range in age from 25 to 89 years old, according to certain research. The majority of adult patients were between the ages of 35 and 55 (Medical ExpertGroup, 2020), with fewer cases identified among children and infants (Wang, 2020). According to a study on the virus's early transmission dynamics, the median age of patients was 59 years, with a range of 15 to 89 years, and the majority (59 percent) were male (Li et al., 2020). People with weakened immune systems, such as the elderly and those with renal and hepatic failure, are thought to be the most vulnerable (Li et al., 2020).

COVID-19 has been discovered to have higher levels of transmissibility and pandemic risk than SARS-CoV, with an effective reproductive number (R) of 2.9, which is higher than the reported effective reproductive number (R) of SARS (1.77) at this early stage. COVID-19 incubation time was calculated to be 2 to 11 days on average (Li et al., 2020). According to the most recent Chinese health guidelines, incubation lasts an average of 7 days, ranging from 2 to 14 days.

6. CONCLUSION

Due to the disease's rapid spread around the globe, the COVID-19 epidemic has posed a threat to practically all sectors. COVID-19, in particular, is an RNA virus that poses a public health risk. Thousands of infections, such as heart disease, dysentery, and malarial symptoms, as well as deaths, have been reported as a result of the sickness.

To prevent further transmission, the rapid development of the disease necessitates thorough research and isolation methods. To enhance the health of patients with the illness, many vaccines and drugs, such as Pfizer-BioNTech and Moderna, have been developed with varying efficacy levels (90-95 percent) in asymptomatic patients. Individuals must therefore take steps to protect themselves from the disease, such as isolation, proper ventilation, hand hygiene, and the use of personal protective equipment, such as surgical masks, eye protection, gloves, and gowns. It is suggested that the academic community conduct more research in order to provide valid and reliable short- and long-term solutions to this type of public health emergency.

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