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COVID-19 A BRIEF OVERVIEW

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ABSTRACT

In December 2019, pneumonia brought on by the severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2) infection first appeared in Wuhan City, Hubei Province, China. The World Health Organization (WHO) will formally refer to the illness brought on by SARS-CoV-2 infection as coronavirus disease by February 11, 2020. (COVID-19). Fever, a dry cough, and exhaustion are the most common clinical symptoms of COVID-19, and pulmonary involvement is often evident. Being extremely infectious, SARS-CoV-2 may infect the majority of people in the general population. Currently, the major sources of the illness, which is spread by respiratory droplets and direct contact, are infected individuals and wild animal hosts. Since the outbreak, the Chinese government and scientific community have moved quickly to uncover the underlying cause, disclose the viral DNA sequence, and implement control measures. While past studies have concentrated on epidemiology, clinical characteristics, diagnosis, treatment, as well as the development of drugs and vaccines, current research has uncovered crucial parts of SARS-CoV-2 biology and disease pathogenesis. This review tries to establish agreement among experts by summarising the most recent study results. Along with current advice for prevention, containment, and essential treatment of this pandemic, we will also discuss existing initiatives and experience from China that may provide light on how to curb the outbreak and further our knowledge of this newly emergent infectious illness.

INTRODUCTION

First case of Covid was observed in Wuhan city of China (Arif et al.2022a; Arif et al. 2022b; Muthanna et al.2022a; Muthanna et al. 2022b). As it is Viral disease and viral diseases don't have any treatment (Samad, Hamza, Muazzam, Ahmer, Tariq, Javaid, et al., 2022; Samad, Hamza, Muazzam, Ahmer, Tariq, Javaid, et al., 2022; Samad et al, 2021; Samad, Hamza, Muazzam, Ahmad, Ahmer, Tariq, et al., 2022a, 2022b; Ibrahim et al., 2022; Mohammed et al., 2022) while bacterial disease also have treatment. (Mohammed et al., 2022b) Global public health is being threatened by the coronavirus disease pandemic of 2019 (COVID-19). A seafood market in Wuhan City, Hubei Province, China, on December 2019 exposed individuals to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that was initially detected and designated as COVID-19 (Zhu N et al., 2020). SARS-CoV-2 is believed to cross species to initiate primary human infections; it is now spread primarily by human-to-human transmission, in line with findings related to SARS-CoV (Drosten et al., 2003; Ksiazek et al., 2003) and Middle East respiratory syndrome coronavirus (MERS-CoV) (Zaki et al., 2012). Although the case fatality rate of COVID-19 (estimated at 2 percent to 3 percent) is lower than that of SARS (about 10 percent) and MERS (about 40 percent), the COVID-19 pandemic has been far more severe. SARS-CoV-2 infection has been detected in 144 nations/territories/areas spanning five continents as of March 15, 2020; it has expanded quickly to 34 Chinese provinces and cities (World Health Organization, 2020). For governments, people, and society as a whole, the COVID-19 epidemic poses a serious challenge. This review provides an overview of the most recent research and professional opinion about the virology, immunology, epidemiology, clinical characteristics, diagnosis, and treatment of COVID-19. In addition to offering continuing advice for the illness's prevention, treatment, and care, our goal is to share the most recent knowledge of both the virus and the disease.

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LITERATURE REVIEW

Immunology and virology

Coronaviruses may be divided into four primary subgroups (,,, and). The coronavirus group consists of six members, including the human diseases Cov-229E and CoV-HKU1. The CoV-OC43, SARS-CoV, and MERS-CoV human infections are included in the coronavirus group (King et al., 2012; Lefkowitz et al., 2018). The seven conserved domains of the genomic open reading frame 1ab (ORF1ab) of SARS-CoV-2, which is also a coronavirus, share 94.6 percent of their amino acid sequences with the original SARS-CoV. (Zhou P et al., 2020b). Usually spherical or irregularly shaped, coronavirus virion particles are. It has a diameter of 120–160 nm and a triple Spike (S) protein protrusion in the form of a petal, which is a characteristic of coronaviruses. During infection, the S protein facilitates membrane fusion and viral attachment (King et al., 2012). The coronavirus genomes often contain three other structural proteins in addition to the distinctive S protein, including the Membrane (M) protein, the Envelope (E), and the Nucleocapsid (N) protein. The coronavirus M protein, which ranges in size from 218 to 263 amino acids (aa), contains an O- or N-glycan-modified N-terminus and a hydrophilic C-terminal tail. There are normally 20 copies of the E protein, which has amino acids 74 to 109, in each virion, and it may play a role in boosting virulence. The coronavirus N protein, which ranges in size from 349 to 470 amino acids, is a phosphorylated RNA-bound protein that aids in the proper folding of genomic RNA into the nucleocapsid (King et al., 2012).

METHOD

SARS-CoV-2 genomic characterization

The SARS-CoV-2 virion contains a positive-sense, single-stranded RNA genome with a length of 29891 bp and a diameter of 60–140 nm (Zhou P et al., 2020b). SARS-CoV-2 and SARS-CoV share 79.5 percent of their genetic sequences, and a remarkable 93.1 percent of their genetic sequences are identical to the RaTG12 virus, which was isolated from a bat (Rhinolophus affinis) living in Yunnan Province, China (Chan et al., 2020a; Zhou P et al., 2020b). These latter findings imply that SARS-CoV-2 may have originated from a virus that Sequence inserts found in the S protein of a coronavirus isolated from a pangolin (Order, Pholidota; Family, Manidae) led to comparative genomic research, which essentially revealed that these animals were most likely the intermediate hosts for cross-species transmission (Liu et al., 2019; Zhang T et al., 2020).

SARS-CoV-2 S protein's infectious properties

The attachment of SARS-CoV-2 S protein to its cell surface receptor, angiotensin-converting enzyme 2 (ACE2), induces viral entry into type II pneumocytes in the human lung, similar to what was subsequently discovered for SARS-CoV. (Gallagher and Buchmeier, 2001). As a result, the S protein is crucial to both the initial transmission of SARS-CoV-2 and its continued infection.

According to Hofmann and Pöhlmann (2004) and Li (2016), the coronavirus S protein has two primary domains: the S1 domain at the protein's N-terminus facilitates binding to ACE2, and the S2 domain at the protein's C-terminus encourages fusion of the virus membrane with the host cell's cellular membrane. The S1 subdomain known as the receptor-binding domain (RBD) has 424–494 amino acids. The peptidase domain (PD), an extracellular binding site on ACE2, is directly in touch with this motif (Li et al., 2005; Wrapp et al., 2020). The S protein has arginines R667 and R797 as its two cleavage sites. The R667 site separates S1 and S2, and the final S2 polypeptide is produced by cleavage at the R797 site (Millet and Whittaker, 2015). These two locations are accessible to a large number of cellular proteases, including factor Xa, cathepsin L, trypsin, elastase, and serine transmembrane proteases (TMPRSSs). To facilitate the entry of SARS-CoV and SARS-CoV-2 into the host cell, cleavage at both S protein sites is necessary; the first is crucial for S1 binding to ACE2, and the second is necessary for membrane fusion (Li, 2016; Millet and Whittaker, 2015).

RESULT

Epidemiology

SARS-CoV-2 is spread via infected people and infected animal hosts. The first hosts of SARS-CoV-2 are thought to be bats, with pangolins perhaps serving as intermediary hosts. Patients who are known to be infectious include both symptomatic and asymptomatic individuals. It is unclear how long the virus sheds, however, or if its transmissibility will change as the illness progresses naturally. The Huanan Seafood Market and many other fresh markets in Wuhan, China provided environmental samples and animal samples for analysis by the Chinese Center for Disease Control and Prevention (CDC). 94 percent of SARS-CoV-2 nucleic acid-positive samples (31/33 cases) were found to originate from the western section of the Huanan Seafood Market, which features stores where wild animals are sold. Many of the known coronaviruses have bats as their natural hosts (de Wit et al., 2016). SARS-CoV-2 is a coronavirus, as previously mentioned. Sequence similarities between SARS-CoV-2 and coronaviruses isolated from bat species have been found to range from 89.0 to 96.2 percent (Zhu N et al., 2020; Zhou P et al., 2020b), suggesting that

Volume 2, **Number** 3, November 2022
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SARS-CoV-2 may have originated from a previous coronavirus that was endemic to bats. Additionally, comparative investigations showed that the nucleic acid sequences of the genomes of SARS-CoV-2 and SARS-CoV had a 79.5 percent similarity, particularly at the two receptor domains where they both share the ACE2 receptor (Zhou P et al., 2020b; Zhu N et al., 2020). Interestingly, there is a 1100 base pair (bp) nucleotide difference between the SARS-CoV-2 and bat coronavirus genomes (Zhou P et al., 2020b). The fact that the main epidemic started during the winter, when bats are hibernating, must also be acknowledged. The results therefore imply the possibility of one or more intermediary hosts connecting the coronaviruses found in bats to those that are transmitted to humans.

Transmission paths

The two major ways that SARS-CoV-2 spreads from person to person are via respiratory droplets and direct contact. (General Office of National Health Commission of the People's Republic of China, 2020; Special Expert Group for Control of the Epidemic of Novel Coronavirus Pneumonia of the Chinese Preventive Medicine Association, 2020) Aerosol and fecal-oral transmissions are additional possible routes but have not yet been confirmed. Transfer of respiratory droplets: Similar to other respiratory viral infections, respiratory droplets are thought to be the main method of transmission. Contact transmission: Since SARS-CoV-2 was discovered to persist on household surfaces, door handles, mobile phones, and other items in the environment of infected people in Guangzhou, China, it is not entirely certain that SARS-CoV-2 can also be transmitted through both direct and indirect contacts with virions (General Office of National Health Commission of the People's Republic of China, 2020). SARS-CoV-2 may spread via the nasal cavity, oral cavity, and other mucous membranes when susceptible people come into contact with bodily fluids (sputum, saliva, faeces) from humans or animals that possess the virus. Similar to direct transmission, indirect transmission of SARS-CoV-2 may happen when susceptible people come into touch with bodily fluid-contaminated things.

DISCUSSION

COVID-19 outbreak

On December 26, 2019, a senior couple with pneumonia of unknown aetiology was diagnosed by Dr. Ji-xian ZHANG at the Hubei Hospital of Integrated Traditional Chinese and Western Medicine. The following day, five patients with comparable clinical manifestations were discovered; the majority of these people had been exposed at the Huanan Seafood Market. She informed the Hubei Provincial Health and Health Committee of this problem on December 29, 2019. (Fan et al., 2020). Retrospective investigation of these early cases showed that from mid-December 2019, widespread human-to-human SARS CoV-2 transmission had occurred in Wuhan (Li et al., 2020). After starting off as a random outbreak, COVID-19 quickly grew into a localised epidemic, then a pandemic. Sporadic epidemic: On January 1, 2020, the Wuhan government declared that the Huanan Seafood Market will be shut down and that the neighbouring farmers' markets and public areas in Wuhan would get stronger preventative measures. Before January 1, the illness was generally discovered in isolated outbreaks or clusters among individuals who had direct contact with the seafood industry. At the time, more than half of the cases discovered had a history of contact with Huanan Seafood Market (Huang et al., 2020). a localised outbreak Only 8.6% of cases that were recorded after January 1, 2020, could be traced back to the Huanan Seafood Market, indicating that the transmission had moved into the neighbourhood. Cluster transmission in several neighbourhoods and households in Wuhan was demonstrably present (Li et al., 2020; Xu Zet al., 2020; Zhu N et al., 2020). The outbreak swiftly spread across Hubei Province and other regions of China since it regrettably coincided with the Chinese Lunar New Year and a period of intensive travel. Pandemic: On January 13, 2020, the Thai authorities recognised a traveller from China who had SARS-CoV-2. Later verified cases emerged in other nations and areas, signalling the start of a pandemic (Munster et al., 2020). All continents of the world have verified instances as of right now, with the exception of Antarctica. There were 81048 confirmed cases in China as of 10 a.m. Central European Time (CET) on March 15, 2020, making the total number of verified cases globally 153717. (World Health Organization, 2020).

Diagnosis and severity evaluation

Any person exhibiting symptoms suggestive of COVID-19 should have an epidemiological history taken; this would include a history of recent travel to or residence in Hubei Province, particularly in Wuhan and/or in other regions and communities affected by COVID-19; information should also be carefully checked on close contact with confirmed or probable patients at home, work, or medical facilities where hospital-associated cases have been reported in the 14 days prior to the present time. A material taken from the upper respiratory tract (nasopharyngeal and oropharyngeal swabs), and if feasible, the lower respiratory tract, must be isolated for SARS-CoV-2, its genome sequenced, or tested for viral nucleic acid by polymerase chain reaction (PCR) (sputum, tracheal aspirate, or bronchoalveolar lavage). To get a thorough diagnosis, tests for other viral pathogens should be run concurrently.

Volume 2, **Number** 3, November 2022
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Management

The current pillars of population management for COVID-19 are illness prevention and control, supportive care, and constant monitoring. In general, oxygen treatment and intensive care are needed for patients who are severely or critically sick since the illness commonly worsens to cause consequences such ARDS, respiratory failure, and septic shock. The mortality rate for patients in an intensive care unit (ICU) environment is still about 40% despite all treatment efforts. Therapies that either restrict viral multiplication or modify the host immune response have been developed in an effort to lower mortality caused by severe COVID-19. Among these, Arbidol therapy has been administered in a cohort of patients hospitalised to the First Affiliated Hospital of Zhejiang University, Hangzhou, China. Arbidol is a broad-spectrum antiviral medication licenced for treating influenza (Xu KJ et al., 2020). Similarly, systemic glucocorticoids have been studied in a number of individuals with moderate illness; despite controversy, this treatment was well tolerated and did not prolong viral shedding (unpublished data).

Drug development for COVID-19 and the creation of vaccines

A crucial tactic for avoiding widespread viral infection and lowering morbidity and death is the development of vaccines. Chinese researchers were the first to isolate the new virus SARS-CoV-2; the public may now access the genomic sequence (Chan et al., 2020b; Zhu N et al., 2020). The development of various SARS-CoV-2 vaccine candidates is made feasible by these developments, collaboration, and open-source data. Inactivated vaccines, live attenuated vaccines, vectored vaccinations, nucleic acid-based vaccines, and recombinant subunit vaccines are among the several kinds of vaccines that are often categorised into categories (Gao et al., 2019).

CONCLUSION

Critical departments have aggressively reacted and coordinated their efforts since the COVID-19 pandemic broke out under the guidance of the Chinese government, and medical professionals have risen to the challenges despite personal risk. The overall pandemic in China has showed a declining tendency, despite the fact that the number of cases is still growing and has not yet peaked. Comprehensive surveillance is still necessary in the present to identify the infection's source, stop its spread, speed up the diagnosis and treatment of suspected cases, and investigate and take action to address any risks of infection and transmission that might arise from the scheduled return to work and school. We now have a comprehensive understanding of the structure and genetic makeup of the SARS-CoV-2, as well as its interactions with a characterised receptor, its host source, Zhou P et al., 2020b; Zhu N et al., 2020; epidemiological characteristics; and the histopathological changes that occur (Xu XT et al., 2020; Zhou P et al., 2020a); all thanks to the tireless efforts of scientific researchers (Xu Z et al., 2020). There are still a lot of important questions that need a solution. Will the SARS-CoV-2 virus change and create new strains? Will COVID-19 continue to exist in our daily lives and hospitals? Exist any more main and/or intermediate hosts for this virus outside bats (Zhou P et al., 2020b; Wu et al., 2020) and pangolins (Lam et al., 2020)? How might isolation and sanitation be made better? It is necessary to do more study so that we may better understand prognosis, diagnosis, and attempts to produce vaccines and medications. Any answer will be crucial for conquering COVID-19 and making plans in case it occurs again.

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