IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

An Overview on COVID 19: Does It Resembles with SARS and MERS

Sneha Kulkarni*[1] Darshana Gohate Iswe[2]

[1, 2] *Department of Pharmacy, Barkatullah University, Bhopal (M.P), India 462026*

ABSTRACT:

Corona viruses represent a major group of viruses and one of them which is known as novel corona virus is responsible for the pandemic COVID -19(Corona virus disease 2019). This disease has started from China and had a global spread till now across 216 countries so far. On 30 January 2020, World Health Organization (WHO) officially declared the COVID-19 epidemic as a public health emergency of international concern. The COVID-19 is associated with the illness of upper respiratory tract which sometimes lead to severe pneumonia and acute respiratory distress syndrome (ARDS). It is related with severe acute respiratory syndrome (SARS) in 2002 and middle east respiratory syndrome (MERS) in 2012. Each of three corona viruses emerged since the turn of the century has caused respiratory outbreaks but has unique characteristics. SARS and MERS have higher fatality rates than COVID-19 but the latter is highly infectious and spreads more easily among the people.

KEYWORDS: COVID -19, SARS, MERS, ARDS, Pandemic, Corona virus.

ABBREVIATIONS:

COVID -19 - Corona virus disease 2019, SARS - Severe acute respiratory syndrome

MERS - Middle east respiratory syndrome

SARS-CoV- Severe acute respiratory syndrome corona virus

MERS-CoV- Middle east respiratory syndrome corona virus

SARS-CoV 2- Severe acute respiratory syndrome corona virus 2

WHO – World Health Organization

I. INTRODUCTION

Corona virus is One of the major class of pathogens that targets primarily to the respiratory system of human. In the previous decades two major outbreaks of corona viruses which includes the Severe acute respiratory syndrome (SARS)-CoV (corona virus) and the Middle East respiratory syndrome (MERS)-CoV (corona virus) crossed the human animal barrier and become a major class of human pathogens. This is observed that these corona viruses are a type of zoonotic viruses and they cause respiratory infections including pneumonia, cold, sneezing and coughing while in animals they cause diarrhoea and upper respiratory diseases. [1,2,3,4]

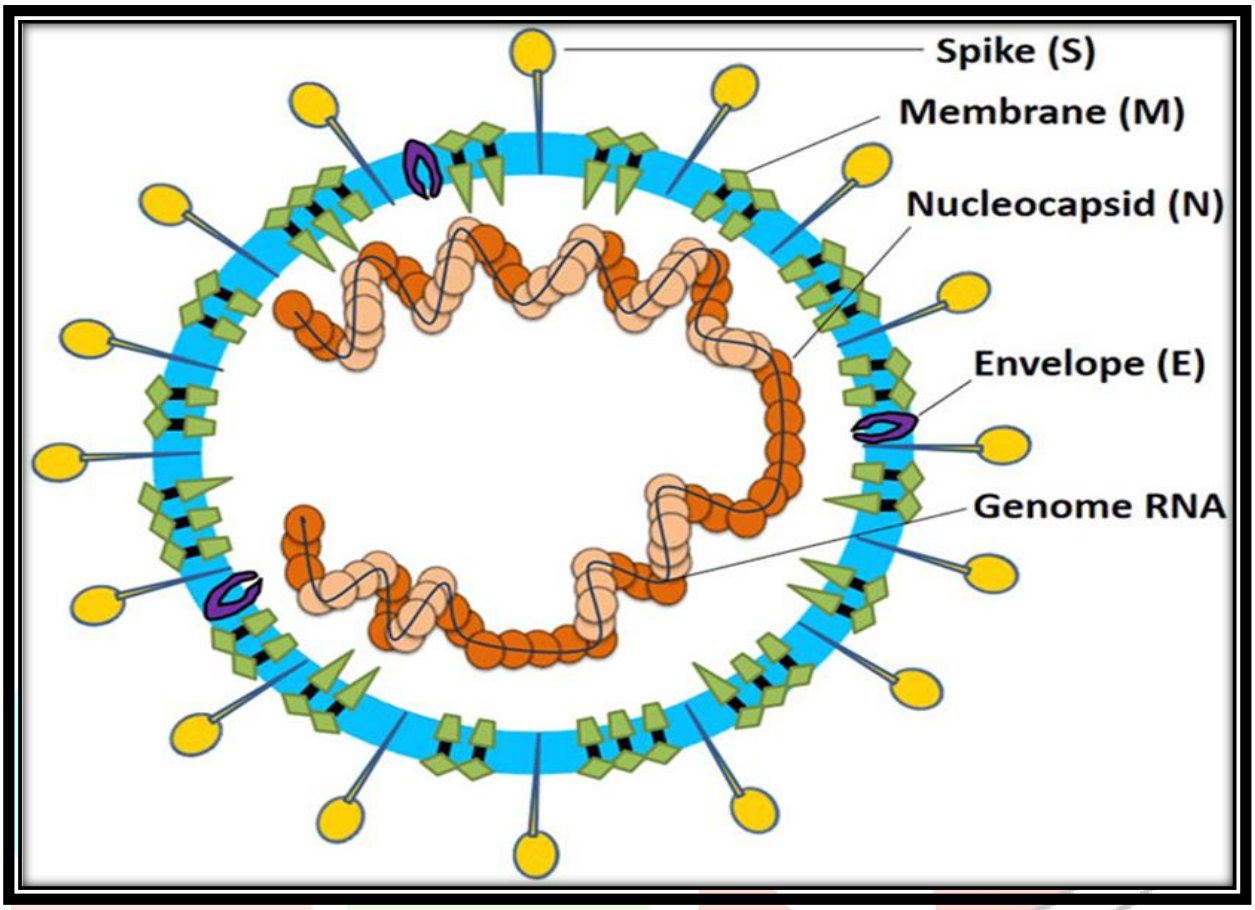
II. HISTORY & ORIGIN

The very first case of corona was observed in 1960. As per the Canadian study 2001 total 500 persons were identified by this flu like infection. Approximately 17-18 cases amongst them were confirmed positive for corona. The mechanism involved in it was polymerase chain reaction. Corona was considered as a virus with non-fatality till 2002. In the year 2003, some reports were published and considered as proofs. SARS-CoV is thought to be an animal virus from an as-yet-uncertain animal reservoir, perhaps bats, that spread to other animals (civet cats) and first infected humans in the Guangdong province of southern China in 2003. Cases were also reported in USA, Hongkong, Taiwan, Thailand, Singapore and Vietnam with |more than 1000 deceased cases. Various studies conducted by researchers concluded the pathogen behind the disease being corona.

Middle East respiratory syndrome (MERS), also known as camel flu, caused by (MERS)-CoV (corona virus) that was first identified in Saudi Arabia in 2012. MERS-CoV has been identified in dromedaries in several countries in the Middle East, Africa and South Asia. Approximately 35% of reported patients with MERS-CoV infection have died.

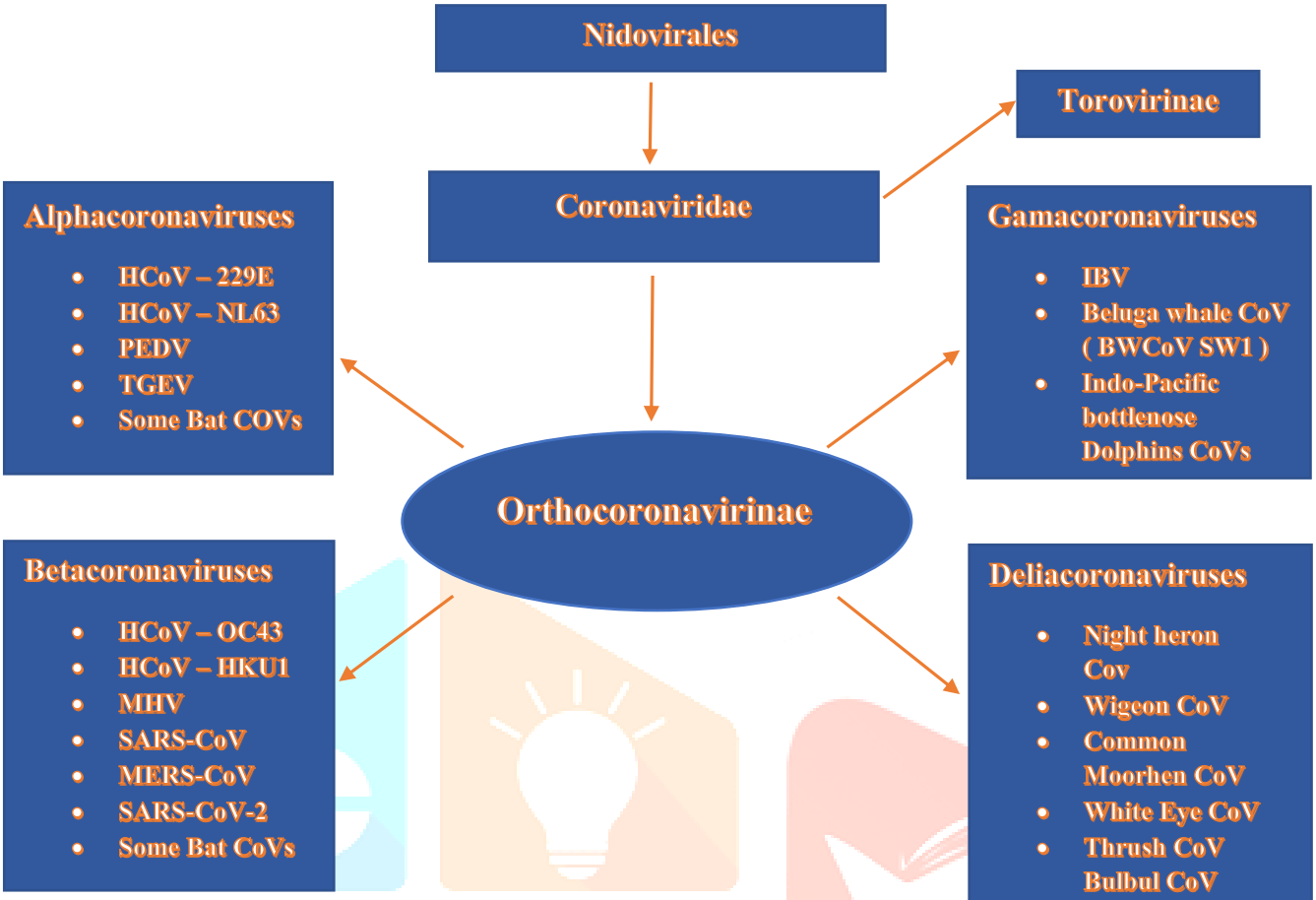
In late December 2019, an acute atypical respiratory disease was observed in Wuhan, Hubei province, China. This infection has spread rapidly from Wuhan to other areas. It was reported that a corona virus named as novel coronavirus was responsible for the disease. The novel coronavirus was further named as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2, 2019-nCoV) due to its high similarity with the shared ancestry (homology) approximately 80% to SARS-CoV, which caused acute respiratory distress syndrome (ARDS). The disease caused by this virus was called Coronavirus disease 19 (COVID-19) and declared as a pandemic by the World Health Organization (WHO). COVID-19 has been impacting a large number of people worldwide & had its spread in approximately 216 countries and territories so far. As of May 31st, 2020, around 5,934,936 cases worldwide have been reported according to World Health Organization (WHO).[2,3,4,6.]

III. STRUCTURE AND ETIOLOGY OF CORONA VIRUS



Structure of Corona Virus

Coronaviruses are enveloped positive stranded RNA viruses in the order of Nidovirales. They are characterized by club-like spikes that project from their surface, an unusually large RNA genome, and a unique replication strategy. With the characteristic surface, the virions have a crown-like appearance under the electron microscope. That's why they are named after the Latin word corona, meaning 'crown'. The subfamily Orthocoronavirinae of the family Coronaviridae is further classified into four coronavirus (CoV) genera: Alpha-, Beta-, Delta-- and Gamma coronavirus. Epithelial cells in the respiratory and gastrointestinal tract are the primary target cells. Due to these characteristics, viral shedding occurs via these systems and transmission can occur through different routes: fomites, airborne or faecal-oral.[4,5,8.9,10,13,14.]



Classification of Corona Virus

IV. TRANSMISSION AND PATHOGENESIS

IV.1 SARS:

As per WHO SARS affected 26 countries more than 8000 cases were reported throughout the world in 2003. Then small number of cases have occurred as a result of laboratory accidents or, possibly, through animal-to-human transmission (Guangdong, China). This disease was transmitted via droplets and fomites and through direct contact of patients with uninfected individuals. The immediate origin of the SARS-CoV that infected humans in the winters of both 2002-2003 and 2003-2004. Himalayan palm civets (*Paguma larvata*) and racoon dogs (*Nyctereutes procyonoides*) harboured viruses highly like SARS-CoV. Recently, SARS-CoV-like viruses have been isolated from several bat species, predominately horseshoe bats (genus *Rhinolophus*).

The main target of SARS coronavirus were the epithelial cells of the upper respiratory tract, resulting finally in the diffuse alveolar damage. Other organs/ cells like mucosal cells of the intestine, kidney's tubular epithelial cells and neutrons of brain may also be suffered from indirect injury.[16,17.]

IV.2 MERS:

Primarily MERS-CoV originated in both human as well as camel was probably from the vesper bats in Southern Africa. The first transfer from bat to camel has likely occurred in Africa, after a recombination has observed leading to genetic divergence in the original bat virus. MERS-CoV antibodies were detected in camel sera long till the first human case reported. MERS-CoV in camels caused mild symptoms and traded camels got infected from Africa and by this way the virus was introduced into the Arabian Peninsula dromedary in 2012. Bats (Taphozos perforates and Rhinopoma hardwickii) are reported as reservoirs for this infection. MERS-CoV had spread from an infected person's respiratory secretions, such as through coughing, sneezing i.e. via droplet infection.

MERS-CoV has spread from ill people to others through close contact, such as caring for or living with an infected person. Infected people have spread MERS-CoV to others in healthcare settings, such as hospitals. By using confocal microscopy, the widespread of MERS-CoV antigen expression in type I and II alveolar cells has observed. Virus antigen was also found in endothelial cells of pulmonary vessels and rarely in alveolar macrophages. Electron microscopy revealed alveolar epithelial damage, consisting of detachment of type II alveolar epithelial cells and associated disruption of tight junctions, chromatin condensation, nuclear fragmentation, and membrane blebbing, responsible for apoptosis. [17,18,19]

IV.3 COVID-19:

The initial cases were linked to direct exposure to infected animals (animal-to-human transmission) at a seafood market in Wuhan, China. However, clinical cases with diversity in exposure history have emerged. As per the earlier reports it was considered that bats are natural hosts, pangolins are intermediate hosts, and humans are terminal hosts. Finally concluded that human-to-human transmission of the virus is also possible. Therefore, human-to-human transmission is now considered the main form of transmission. Individuals who remain asymptomatic could also transmit the virus. However, the most common source of infection is symptomatic people.

Transmission occurs from the spread of respiratory droplets through coughing or sneezing. Data also suggest that close contact between individuals can also result in transmission. This also indicates possible transmission in closed spaces due to elevated aerosol concentrations. This suggests that a patient can transmit the infection to other individuals. Available data suggest that the virus has an incubation period of three to seven days. These findings are based on initial cases.

The SARS-CoV 2 SARS-CoV-2 likely binds to epithelial cells in the nasal cavity and starts replicating. ACE2 (Angiotensin converting enzyme) is the main receptor for both SARS-CoV2 and SARS-CoV. The local propagation of the virus is observed there but a limited innate immune response. At this stage the virus can be detected by nasal swabs. [7 11.]

V SYMPTOMS:

People suffering from COVID 19 have few of these symptoms.

- Fever
- Dry cough
- Sore Throat
- Fatigue
- Shortness of breath
- Acute Respiratory Distress Syndrome
- Sputum Production

VI DIAGNOSIS:

Real-time reverse transcriptase-polymerase chain reaction (RT-PCR) testing of upper and lower respiratory secretions is used for detection.

The following specimens are acceptable for testing as per Centre for Testing and Prevention (CDC) recommended guidelines:

- A nasopharyngeal specimen collected by a healthcare professional
- An oropharyngeal (throat) specimen collected by a healthcare professional.
- A nasal mid-turbinate swab collects by a healthcare professional or by a supervised onsite self-collection (using a flocked tapered swab)
- An anterior nares specimen collects by a healthcare professional or by onsite or home self-collection (using a flocked or spun polyester swab)
- A nasopharyngeal wash/aspirate or nasal wash/aspirate specimen collected by a healthcare professional.

VII PREVENTION:

The following guidelines should be followed for prevention of COVID -19:

1. Wash your hands frequently with soap and water for 20 seconds or use alcohol-based (70%) sanitizers.
2. Always avoid touching any part of your face or head including your mouth, nose, and eyes. Also avoid biting your fingernails. This can give SARS-CoV-2 a chance to go from your hands into your body.
3. Stop shaking hands and hugging others.

4. SARS-CoV-2 is found in high amounts in the nose and mouth. This means it can be carried by air droplets to other people when you cough or sneeze. It can also land on hard surfaces and stay there for up to 3 days.

5. Use alcohol-based disinfectants to clean hard surfaces in your home like countertops, door handles, furniture, and other articles. You can also sanitize your phone, laptop, and anything else you use regularly several times a day.

6. Avoid social gatherings and maintain social distancing.

7. Wash groceries and vegetables or fruits with white vinegar or any other recommended wash for cleaning.

8. If you have observed any symptoms so self-isolation is an important measure taken by those who have COVID-19 symptoms to avoid infecting others in the community, including family members.

9. You can also take the recommended preparations to boost your immunity against these pathogens.[18,19.]

VIII TREATMENT:

Till date there is no specific antiviral drug approved for covid-19. The treatment of disease mainly relies on medicines which are used for symptoms and supportive care. It has been observed that an important mechanism behind deterioration of the clinical condition is due to the high induced levels of mediators of inflammation like Interferon -α, Interferon-β, and IL-6 etc. By using these medicines, the secretion of these factors gets reduced, finally the conditions of the patients are improving.

The effective drugs either in the form of vaccines for prophylaxis or for therapeutics are needed. But in the present scenario drugs are used on the basis of preclinical and clinical reports. Developing new drug is a tedious task in pandemic emergency. So, at present doctors are using well known anti-infective molecules (chloroquine/hydroxychloroquine, anti-retroviral drugs, anti-influenza, antibacterial agents), anti-rheumatic/anti-cytokine release syndrome drugs, antithrombotic agents are used for COVID-19.[22,23,25].

Drugs against COVID -19

Name of Drugs	Basic Moiety	Mechanism of action	Therapeutic Use
Chloroquine	4-aminoquinoline	Not clear, changes the pH of endosomes and believed to prevent viral entry, transport and post-entry events	Inhibits infection of cells by SARS-CoV-2 *in vitro*, approved for malaria treatment and prophylaxis
Hydroxychloroquine	4-aminoquinoline	It is also not clear, changes the pH of endosomes and believed to prevent viral entry, transport and post-entry events	Inhibits infection of cells by SARS-CoV-2 in vitro, approved for malaria prophylaxis and autoimmune disease (e.g. rheumatic diseases). Approved for treatment of T2DM in India
Remdesivir	Adenosine nucleotide analogues	Inhibits viral application	Limit the reproduction and spread of the virus (SARS CoV 2-). It is also effective against SARS and MERS. Initially used to treat Ebola
Ribavirin	Nucleoside analogue	Inhibits viral RNA synthesis and mRNA capping	Effective against MERS. SARS CoV-A2 has pathological similarity with MERS
Ribavirin + Interferon	Ribavarin incorporate into RNA	Inhibits viral replication	Mixed result against MERS
Lopinavir/Ritonavir	Protease inhibitors	Blocks viral cellular entry	Effective against SARS-CoV-1& 2 both *in vitro* and human studies, approved for HIV-1 treatment

Favipiravir	RNA polymerase inhibitors	Inhibits viral RNA-dependent polymerase	Broad-spectrum anti-viral against influenza, arenavirus, bunyavirus and filovirus
Interferon-β1	Cytokines	Stimulate innate antiviral immunity.	MERS-CoV appears to be more sensitive than SARS-CoV in vitro studies. Anti-MERS-CoV action noted in animal studies.
Interferon beta plus Lopinavir/Ritonavir		Interferon beta inhibits viral replication	Ongoing study for SARS-Cov-2 and MIRACLE trial for MERS
Tocilizumab, Sarilumab Eculizumab	Monoclonal antibody	IL-6 inhibitor, blocks cytokine storm.	Tocilizumab reduced fever and oxygen requirement in COVID-19, approved for rheumatoid arthritis.
SARS-Cov-2 specific antibodies (Plasma Therapy)	Antibody	Binds to virus and block infection, binds to infected cells and potentiate the immunity of an individual	Inhibits SARS-CoV-2 entry into cells in vitro

IX CONCLUSION:

The coronavirus COVID-19 pandemic is the defining global health crisis of our time and the greatest challenge we have faced since World War Two. Cases are rising daily across the globe. All countries can have control over the rate of spread by testing and treating patients, carrying out contact tracing, limiting travel, quarantining citizens, and avoiding large gatherings such as sporting events, concerts, and schools. COVID-19 is much more than a health crisis. By stressing every one of the countries it touches, it has the potential to create devastating social, economic, and political crises that will leave deep scars. Every country needs to act immediately to prepare, respond, and recover.

REFERENCES:

[1] Petrosillo N, Vicenit G, Ergonul O, Peterson E, Jippolito G et al. "COVID-19, SARS and MERS: are they closely related?" Clinical Microbiology and Infection; 26 (2020) 729-734.

[2] Rothana A H & Byrareddy S N. "The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak" Journal of Autoimmunity; 109 (2020) 102433.

[3] Kaul D. "An overview of coronaviruses including SARS -2 corona virus molecular biology, epidemiology, clinical implications" Current Medicine Research and Practice; 10(2020) 54-64.

[4] Shi Z, Hu Z. "A review on studies on animal reservoirs of the SARS coronavirus" Virus Research; 133 (2008) 74–78.

[5] Danuta M S, Astell C, Brunham, R C, Low D E, Petric M, Roper R L, Talbot P J, Tam T & Babiuk L et al. "Severe acute respiratory syndrome (SARs): A Year in Review" Annual Review Med.; 2005 (56) 357–81.

[6] Su S, Wong G, Shi W, Liu J, Lai Alexander C K, Zhou J, Liu W, Bi Y & Gao G F et al. "Epidemiology, genetic recombination and pathogenesis of corona virus" Trends in Microbiology; 2016 (24)6 492-502

[7] Letko, Marzi & Munster (2020) Letko M, Marzi A, Munster V. Functional assessment of cell entry and receptor usage for SARS-CoV-2 and another lineage B beta coronavirus. Nature Microbiology. 2020; 5:562–569.

[8] Ling et al. (2020) Ling Y, Xu SB, Lin YX, Tian D, Zhu ZQ, Dai FH, Wu F, Song ZG, Huang W, Chen J, Hu BJ, Wang S, Mao EQ, Zhu L, Zhang WH, Lu HZ. Persistence and clearance of viral RNA in 2019 novel coronavirus disease rehabilitation patients. Chinese Medical Journal. 2020; 133:1039–1043.

[9] Li (2016) Li F. Structure, function, and evolution of coronavirus spike proteins. Annual Review of Virology. 2016;3(1):237–261.

[10] Loeffelholz & Tang (2020) Loeffelholz MJ, Tang Y-W. Laboratory diagnosis of emerging human coronavirus infections—the state of the art. Emerging Microbes & Infections. 2020;9(1):747–756.

[11] Lu (2020) Lu H. Drug treatment options for the 2019-new coronavirus (2019-nCoV) BioScience Trends. 2020;14(1):69–71.

[12] Mao et al. (2020) Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, Chang J, Hong C, Zhou Y, Wang D, Miao X, Li Y, Hu B. Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China. JAMA Neurology. 2020; L (2020):683.

[13] Minato et al. (2020) Minato T, Nirasawa S, Sato T, Yamaguchi T, Hoshizaki M, Inagaki T, Nakahara K, Yoshihashi T, Ozawa R, Yokota S, Natsui M, Koyota S, Yoshiya T, Yoshizawa-Kumagaye K, Motoyama S, Gotoh T, Nakaoka Y, Penninger JM, Watanabe H, Imai Y, Takahashi S, Kuba K. B38-CAP is a bacteria-derived ACE2-like enzyme that suppresses hypertension and cardiac dysfunction. Nature Communications. 2020; 11:1058.

[14] Oh et al. (2016) Oh MD, Park WB, Choe PG, Choi SJ, Kim JI, Chae J, Park SS, Kim EC, Oh HS, Kim EJ, Nam EY, Na SH, Kim DK, Lee SM, Song KH, Bang JH, Kim ES, Kim HB, Park SW, Kim NJ. Viral load kinetics of MERS coronavirus infection. New England Journal of Medicine. 2016; 375:1303–1305.

[15] Omrani et al. (2014) Omrani AS, Saad MM, Baig K, Bahloul A, Abdul-Matin M, Alaidaroos AY, Almakhlafi GA, Albarrak MM, Memish ZA, Albarrak AM. Ribavirin and interferon alfa-2a for severe Middle East respiratory syndrome coronavirus infection: a retrospective cohort study. Lancet Infectious Diseases. 2014; 14:1090–1095.

[16] Park et al. (2019) Park S, Park JY, Song Y, How SH, Jung K-S. Emerging respiratory infections threatening public health in the Asia-Pacific region: a position paper of the Asian Pacific society of respirology. Respirology. 2019;24(6):590–597.

[17] Arabi Y.M., Arifi A.A., Balkhy H.H., Najm H., Aldawood A.S., Ghabashi A. Clinical course and outcomes of critically ill patients with Middle East respiratory syndrome coronavirus infection. Ann. Intern. Med. 2014;160(6):389–397.

[18] Almekhlafi G.A., Albarrak M.M., Mandourah Y., Hassan S., Alwan A., Abudayah A. Presentation and outcome of Middle East respiratory syndrome in Saudi intensive care unit patients. Crit. Care. 2016;20(1):123.

[19] Wang D., Hu B., Hu C., Zhu F., Liu X., Zhang J. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in wuhan, China. J. Am. Med. Assoc. 2020;323(11):1061–1069.

[20] Lau E.H.Y., Hsiung C.A., Cowling B.J., Chen C.-H., Ho L.-M., Tsang T. A comparative epidemiologic analysis of SARS in Hong Kong, Beijing and Taiwan. BMC Infect. Dis. 2010; 10:50.

[21] Yang X., Yu Y., Xu J., Shu H., Xia Ja, Liu H. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. The Lancet Respiratory medicine. 2020;8(5):475–481.

[22] Antonio G.E., Wong K.T., Hui D.S.C., Wu A., Lee N., Yuen E.H.Y. Thin-section CT in patients with severe acute respiratory syndrome following hospital discharge: preliminary experience. Radiology. 2003;228(3):810–815.

[23] Das K.M., Lee E.Y., Singh R., Enani M.A., Al Dossari K., Van Gorkom K. Follow-up chest radiographic findings in patients with MERS-CoV after recovery. Indian J. Radiol. Imag. 2017;27(3):342–349.

[24] Paul N.S., Roberts H., Butany J., Chung T., Gold W., Mehta S. Radiologic pattern of disease in patients with severe acute respiratory syndrome: the Toronto experience. Radiographics: a review publication of the Radiological Society of North America, Inc. 2004;24(2):553–563.

[25] Grinblat L., Shulman H., Glickman A., Matukas L., Paul N. Severe acute respiratory syndrome: radiographic review of 40 probable cases in Toronto, Canada. Radiology. 2003;228(3):802–809 Wong K.T., Antonio G.E., Hui D.S.C., Lee N., Yuen E.H.Y., Wu A. Severe acute respiratory syndrome: radiographic appearances and pattern of progression in 138 patients. 2003;228(2):401–406.