EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 9
Issue: 10
89-92
Year: 2022

PATHOPHYSIOLOGY, WIDESPREAD CAUSE AND MANAGEMENT OF SARS-COV2 – AN OVERVIEW

Thulasingam Muthukumaran*, Sam Johnson Udaya, Chander J, Gomathi J, Kavitha C, Clement Atlee W and Sabbathyan Balla

Assistant Professor, Department of Pharmacology, CL Baid Metha College of Pharmacy, 2/304, Rajiv Gandhi Salai, Jothi Nagar, Thoraipakkam, Chennai, Tamil Nadu 600097.

***Corresponding Author: Thulasingam Muthukumaran**
Assistant Professor, Department of Pharmacology, CL Baid Metha College of Pharmacy, 2/304, Rajiv Gandhi Salai, Jothi Nagar, Thoraipakkam, Chennai, Tamil Nadu 600097.

Article Received on 29/07/2022 **Article Revised on 19/08/2022** **Article Accepted on 09/09/2022**

ABSTRACT
The 2020 global outbreak of the novel coronavirus (SARS-CoV-2 or COVID-19) is a serious threat to international health, and thus, there is an urgent need for discovery of novel therapies or use of repurposed drugs that can make a significant impact on slowing the spread of the virus. Progression of COVID-19 is thought to occur as a result of a complex interplay between multiple pathophysiological mechanisms, all of which may orchestrate SARS-CoV-2 infection and contribute to organ-specific tissue damage. In this respect, dissecting currently available knowledge of COVID-19 immunopathogenesis is crucially important, not only to improve our understanding of its pathophysiology but also to fuel the rationale of both novel and repurposed treatment modalities. Various immune-mediated pathways during SARS-CoV-2 infection are relevant in this context, which relate to innate immunity, adaptive immunity, and autoimmunity. Pathological findings in tissue specimens of patients with COVID-19 provide valuable information with regard to our understanding of pathophysiology as well as the development of evidence-based treatment regimens. This review provides an updated overview of the main pathological changes observed in COVID-19 within the most commonly affected organ systems, with special emphasis on immunopathology. Current management strategies for COVID-19 include supportive care and the use of repurposed or symptomatic drugs, such as dexamethasone, remdesivir, and anticoagulants. Ultimately, prevention is the key to combat COVID-19, and this requires appropriate measures to attenuate its spread and the development, implementation of effective vaccines.

KEYWORDS: SARS CoV-2, Pathophysiology, Causing agents, Treatment. Prevention.

INTRODUCTION
The coronavirus is an emerging threat for the recent years especially in 2019-2020. It affects both animals and humans. It has been discovered 50 years before, but there is no standard therapy available till now. The predecessor of corona family is severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and endemic human corona virus E-COV.[1] It may cause symptoms such as pneumonia, fever, breathing difficulty, tiredness, and chills. The term 2019 novel corona virus was given by WHO as it affects the lower respiratory tract of patients with pneumonia in Wuhan, China in 29 December 2019. COVID-19 is the official name announced by WHO.[2]

In the first two decades of 21st century, Corona was the third Zoonotic breakout that allows human-to-human transmission and also a notable global health concern. By March l1, 2020 WHO announced this disease as a pandemic as it spreads and has a confirmed case of 80,955 and mortality rate of 3162 in China.[3]

Historical background
The first strain, the prototype murine corona virus strain JHM was isolated in the year 1949. In the year 1970's the molecular mechanisms of replications and their pathogenesis was studied.

The animal corona virus includes porcine transmissible gastroenteritis virus (TGEV) bovine coronavirus (BCOV), and avian infections bronchitis virus (IBV) is verticality important. The virus used in the study of human disease screaming model is MHV (Mouse Hepatitis Virus).

The name "Corona Virus" coined in 1968. The observation of "Corona-like" and "Crown-like" morphology in the electron-microscope paved the way for naming purpose.[4]

Causing agents
15-30% of the respiratory tract infections are caused by the endemic corona virus family. It will produce severe

respiratory illness to the neonates, the elderly. The higher possibilities of easily getting corona virus infections are those who are suffering with respiratory illness, diabetes, kidney failure and also with the chronic liver disease.

SARS-COV, a group of 2b β-Corona-virus is the causative agent of SARS outbreak takes place in 2002-2003 in China, Guangdong. Approximately 8,098 cases reported and 774 peoples were died 2b β-Corona-virus is expelled from the bats and spreads to many peoples.

SARS-COV affects the lung (epithelial cells). It has the potency to enter the macrophages and also dendric cells causes severe infection.

SARS-COV has two prototypes human corona-virus such as 0C43 and 229E. These shows the common symptoms such as common cold, hepatitis and enteric diseases in the new born babies.

After a large control measure SARS-COV epidemic was controlled in 2003.

In 2012, the MERS (Middle East Respiratory Syndrome-COV (MERS-COV) was the causative agent in Saudi Arabia and Middle East Countries which causes severe respiratory treat infection.

855 cases were reported and 333 deaths with fatality rate of nearly 40% was reported in August 27th 2014.[5]

MERS-COV is a group of 2c β-coronavirus namely HKO-4 and HKV5. The virus also originated from bats and also dromedary camels. The major outbreak of MERS-happened due to human-camel transmission more than human-bat transmission dipeptidyl peptidase 4 (DPP4) is the receptor of MERS-COV. The animal model of MERS COV had developed using an adenoviral vector to introduce the human DPP4 gene into mouse lungs [2]

Mode of transmission

The first case of COVID-19 was found in China. The direct exposure to the human seafood wholesale marked of Wuhan by the animal-to-human transmission. This virus also to transmitted to human-to-human and the spread is more frequently.[4]

The transmission also occurs through the respiratory droplets with respiratory pathogen such as flu and rhino-virus from coughing and sneezing-aerosol transmission, close contact between the individuals has transmitted the maximum spread. COVID-19 infection may lead to the intestinal infection and also present in feces.[6]

Types and Families

In June 2005, the 10th international Nidovirus symposium proposed that the *coronaviridae*family denied into two sub families which named as the corona viruses and toraviruses which cases severe pandemic infections.

The *coronoviridae* along with *Asterviridere* and *Roniveridae* families belongs to the Nedovirales order.

Family	Pathogens
Arteveridae	Swine and Equine
Roniveridae	Intervertebrate virus

Coronavirus divided into three genres (I TO III)

Groups	Pathogens
I	TGEV, porcine epidemic diarrhoea virus (PGDV) and Feline infections peritonitis virus (FIPV) Human coronavirus (HCOV)
II	Veterinary relevance, BCOV, Porcine hemagglutinating Encephalomyelitis virus and Human coronavirus such as OC43 AND NL63, HCOV-229E causes severe respiratory infections, MHV causes enteric hepatitis and chronic demyelination.
III	Includes avian corona virus, IBV, Pheasant coronavirus and turkey coronavirus

All these types and sequences are detected using RTPCR (Reverse Transpiration PCR).

Common human coronavirus is 229E, NL63 and HK01 which will cause severe respiratory infection in human beings.[7]

Pathogenesis

The several forms of coronavirus and their pathogenesis are discussed bellows.

(1) Sars cov

It was first diagnosed in China in November 2002. It is a novel infective disorder which SARS causes triphasic patterns of diseases initially it produces fever, cough, sore throat, dyspnoea, and myalgia for 7-14 days of illness in the first phase. In the second phase, the severe respiratory obstruction was occurred by the third week. In third phase death occurs due to the failure of organs associated with respiration at the onset of 108 days.[12]

(2) Human coronavirus

Two prototypes of human coronaviruses are found namely OC43 and 229E having the symptoms of common cold. It will cause severe infections and diseases such as multiple sclerosis enters disease in new-born and hepatitis.[13]

Direct contact with infected individuals after the onset of illness may transmit the SARS COV efficiently. It primarily affects the lungs and mainly affects the

epithelial cells. Once the individuals get infected their cytokines and chemokines levels are elevated.[14]

Treatment

For COVID-19 There is no specific antiviral treatment and vaccination is not yet available. Symptomatic treatment with oxygen therapy is given for the severe infection.[17]

The first-time treatment for the SARS parents in the administration of steroids aimed to modulate the suppression of cytokine release.[18] To prevent the bacterial infections, and anti-bacterial therapy also given. Combinational therapy such as steroids (To modulate the release of cytokine deregulation) in combination t the ribavirin (A nucleoside with broad anti-viral activity).[15,16]

The therapy used in the treatment of SARS COV to inhibit their activity such as.

- Antiviral antibodies
- Protease inhibitor
- Enteric inhibitor
- Caplain inhibitors
- Nucleoside analogues
- Human immunodeficiency virus type I inhibitors

The patients who had recovered from the SARS, MERS and COVID-19 their plasmas are collected and stored in a suitable preservative medium; it is used as an immunotherapy for the patients those who are suffering from the virus.[17]

Prevention

To present infections the below points are to be followed,

- Regularly wash hands with soap and water and cleaned (or) rubbed with alcohol-based hand rub.
- At least 1 metre distance should be maintained between the individuals.
- Avoid touching your face, nose and eyes without washing the hands.
- Cover our mouth and nose when coughing or sneezing.
- Stay quarantine if you feel unwell.
- Refrain from smoking and the actions that weaken the lungs.
- Use your elbow while sneezing and coughing.
- Avoid unnecessary travel and avoid crowd.[6]

CONCLUSION

It is a challenging task to fight the 2020 n-COV pandemic condition outbreak. SARS, MERS AND COV taught a good lesson regarding the situation handling about the pandemic condition. Hand hygiene, isolating yourself, quarantine, social distancing, community containment, wearing masks are the basic habits for the hygienic life also been taught by the COVID-19.[9]

Over the past 70 years the emergence of many different coronavirus caused a variety of human and veterinary disease due to the recombination, mutation and multiple species. [10]

Researchers and ongoing research in future is being investigated the viral replication patterns and pathophysiology of coronavirus.[11] The non-structural and accessory proteins encoded by these viruses are not known and characterised. It is important to understand the role and mechanism of action of protein those who are participating in viral replication and pathogenesis. Finally, protein's role, mechanism of disease, understanding host immune pathological response helps to design vaccines and reduce the rest of disease and their burden. Stay safe, stay healthy and stay home.[8]

REFERENCES

1. Stockman LJ, Bellamy R, Garner P. SARS: systematic review of treatment effects. Plops Medicine, Coronaviruses: An Overview of Their Replication and Pathogenesis Anthony R. Fehr and Stanley Perlman, 2006; 3(9): e343, 10.
2. Insight into novel coronavirus — an updated interim review and lessons from SARS-Cov and MERS-CoV, 2019. DOI: https://doi.org/10.1016/j.ijid.2020.03.071
3. Corona virus pathogenesis chapter 4 Sasmita Poudel Adhikari, Sha Meng, Yu-Ju Wu, Yu-Ping Mao, Rui-Xue Ye, Qing-Zhi Wang, Chang Sun, Sean Sylvia, Scott Rozelle, Hein Raat and Huan Zhou Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. I Bio Med Central, 2020.
4. World Health Organization. Depression, 2020. [Cited 20th march, 2020] Available from: https Corona virus types https://www.healthline.com/health/coronavirus-types
5. COVID-19: what is next for public health? Published Online February, 2020; 12. https://doi.org/10.1016/ S0140-6736(20)30374-3.
6. A. Roberts, E.W. Lamirande, L. Vogel, J.P. Jackson, C.D. Paddock, J. Guarner, *et al.* Animal models and vaccines for SARS-CoV infection Virus Res, 2008; 133(1): 20-31.
7. M.J. Vincent, E. Bergeron, S. Benjannet, B.R. Erick son, P.E. Rollin, T.G. Ksiazek, *et al.* Chloroquine is a potent inhibitor of SARS coronavirus infection and spread Virol. J, 2005; 2: 69.
8. Spiegel M, Pichlmair A, Martínez-Sobrido L, et al. Inhibition of beta interferon induction by severe acute respiratory syndrome corona-virus suggests a two-step model for activation of interferon regular-tory factor 3. J Virol, 2005; 79(4): 2079-2086.
9. Hu Y, Li W, Gao T, et al. The severe acute respiratory syndrome coronavirus nucleocapsid inhibits type I interferon production by interfering

with TRIM25-mediated RIG-I ubiquitination. J Viral, 2017; 91(8): e02143-16.
10. Yang Y, Ye F, Zhu N, et al. Middle East respiratory syndrome corona-virus ORF4b protein inhibits type I interferon production through both cytoplasmic and nuclear targets. Sci Rep, 2015; 5(1): 17554.
11. Soye KJ, Trottier C, Richardson CD, Ward BJ, Miller WH. RIG-I is required for the inhibition of measles virus by retinoids. Plops One, 2011; 6(7): e22323.
12. Chen S, Yang Y, Xu J, Su L, Wang W. Effect of all-trans-retinoic acid on enterovirus 71 infection in vitro. Br J Nutr, 2014; 111(9): 1586-1593.
13. Kast RE. Potential for all-trans retinoic acid (tretinoin) to enhance interferon-alpha treatment response in chronic myelogenous leu-kemia, melanoma, myeloma and renal cell carcinoma. Cancer Biol Ther, 2008; 7(10): 1515-1519.
14. Li B, Wang Y, Shen F, et al. Identification of retinoic acid receptor agonists as potent hepatitis B virus inhibitors via a drug repurposing screen. Antimicrob Agents Chemother, 2018; 62(12): e00465-18.
15. Angulo A, Chandraratna RA, LeBlanc JF, Ghazal P. Ligand induction of retinoic acid receptors alters an acute infection by murine cyto-megalovirus. J Virol, 1998; 72(6): 4589-4600.
16. Lee H, Ko G. Antiviral effect of vitamin A on norovirus infection via modulation of the gut microbiome. Sci Rep, 2016; 6(1): 25835.
17. Trottier C, Chabot S, Mann KK, et al. Retinoids inhibit measles virus in vitro via nuclear retinoid receptor signaling pathways. Antiviral Res, 2008; 80(1): 45-53.