

# Literature Review of Epidemiological Phenomena: Corona Virus Disease Pandemic 2019

Yarmaliza, Teungku Nih Farisni, Fitriani, Zakiyuddin, Fitrah Reynaldi, Safrizal, Lili Eky Nursia N

**Abstract**—Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or Corona virus is a new type of coronavirus that is transmitted to humans. Corona virus infection called COVID-19 (Corona Virus Disease 2019) was first discovered in the city of Wuhan, China at the end of December 2019. Until March 2, 2020, more than 80 thousand confirmed cases have been reported in China. Of these cases, 49 thousand were identified in Wuhan City. Epidemiologically, the spread or distribution of this disease has a wide social and economic impact on the world. Many literature studies about the COVID-19 outbreak, such as causes, natural history of the disease, even to the preventive and medical treatment. Since the end of 2019 until April 2020, there have been many published literature or literature studies at both national and international levels, so this paper aims to examine literature studies related to COVID-19.

**Index Terms**—COVID 19, Epidemiology, Pandemic

## I. INTRODUCTION

In China, on December 31, 2019 reported a mysterious case of pneumonia with no known cause, in 3 days, the number of patients with such cases was 44 and continues to grow to the present number of thousands of cases.[1] Initially epidemiological data showed 66% of patients were related or exposed with a seafood market or live market in Wuhan, Hubei Province, China.[2] The World Health Organization (WHO) announced a new name on February 11, 2020 namely Coronavirus Disease (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS) virus CoV-2).[2,3]

Based on the phenomena that have occurred, this virus can be transmitted from human to human and has spread widely in China. On March 12, 2020, WHO announced COVID-19 as a pandemic.[4] As of March 29, 2020, there were 634,835 cases and 33,106 deaths worldwide. While in Indonesia, there have been 1,528 cases with positive COVID-19 cases and 136 death cases.[4,5]

The clinical signs and symptoms reported are mostly fever, with some cases having difficulty breathing, and X-rays show extensive pneumonia infiltrates in both lungs.[5] According to the results of initial epidemiological investigations, the majority of cases in Wuhan have a history of working, handling, or visitors who frequently visit the Huanan Seafood Wholesale Market.[6] Until now, the cause of transmission is still not known with certainty. Clinical manifestations usually appear within 2 days to 14 days after exposure. Common signs and symptoms of coronavirus infection include symptoms of acute respiratory disorders such as fever, coughing and shortness of breath. In severe cases can cause pneumonia, acute respiratory syndrome, kidney failure, and even death.[7]

Extraordinary events by Coronavirus is not the first time. In 2002 severe acute respiratory syndrome (SARS) caused by SARS-coronavirus (SARS-CoV) and Middle East respiratory syndrome (MERS) in 2012 was caused by MERS-Coronavirus (MERS-CoV) with a total accumulative case of around 10,000 (1000s of around 1000s MERS cases and 8000 SARS cases). Mortality due to SARS is around 10% while MERS is higher at around 40%.[7,8]

Pandemics or global epidemics indicate that COVID-19 infection is so fast that almost no country or region in the world is absent from the Corona virus. The increase in the number of cases occurred in such a short time that needed immediate treatment. Until now there has been no specific drug to handle cases of Corona virus infection or COVID-19.[9]

## II. CORONAVIRUS CHARACTERISTICS

Coronaviruses have capsules, round or elliptical particles, often pleiomorphic with a diameter of about 50-200 m. All Nidovirales viruses have capsules, are not segmented, and are RNA positive viruses and have very long RNA genomes<sup>8</sup>. The structure of the coronavirus forms a cube-like structure with protein S located on the surface of the virus. S protein or spike protein is one of the main antigen protein viruses and is the main structure for writing genes. This S protein plays a role in attachment and entry of the virus into the host cell (the interaction of the S protein with its receptors in the host cell).[9]

COVID-19 is a genus of coronavirus  $\beta$  and has different genetic characteristics from SARSr-CoV and MERSr-CoV. Coronavirus is sensitive to ultraviolet light and heat, and can be effectively deactivated when the ambient temperature is 560 C for 30 minutes, fat solvents such as ether, 75% ethanol, disinfectants containing chlorine, pyroxyacetic acid and chloroform except chlorhexidine. Based on current epidemiological investigations, the incubation period for COVID-19 is 1-14

---

Published on June 7, 2020.

Yarmaliza, Faculty of Public Health, Universitas Teuku Umar, Indonesia. (corresponding e-mail: yarmaliza@utu.ac.id)

Teungku Nih Farisni, Faculty of Public Health, Universitas Teuku Umar, Indonesia. (e-mail: teungkuni@utu.ac.id)

Fitriani, Faculty of Public Health, Universitas Teuku Umar, Indonesia. (e-mail: fitriani@utu.ac.id)

Zakiyuddin, Faculty of Public Health, Universitas Teuku Umar, Indonesia. (e-mail: zakiyuddin@utu.ac.id)

Fitrah Reynaldi, Faculty of Public Health, Universitas Teuku Umar, Indonesia. (e-mail: fitrahreynaldi@utu.ac.id)

Safrizal, Faculty of Public Health, Universitas Teuku Umar, Indonesia. (e-mail: safrizal@utu.ac.id)

Lili Eky Nursia N, Faculty of Public Health, Universitas Teuku Umar, Indonesia. (e-mail: lilieky@utu.ac.id)

days, and generally within 3 to 7 days. At present, the main sources of infection are COVID-19 patients and asymptomatic COVID-19 carriers can also be a source of infection. The main transmission routes are respiratory droplets and close contact, while the aerosol and fecal-oral transmission routes have not been verified. Humans in all age groups are generally vulnerable.[9,10]

One of the characteristics of Covid-19 disease is that it is easily transmitted, so it can quickly infect many people. This rapid distribution can be illustrated by the red curve in the graph below. The curve will reach its peak by surpassing the capacity of the health system to handle it.[9] Experts say imposing a curve or slowing the spread of the corona virus (COVID-19) is a way to end the pandemic. According to them the point is to bend the curve, preventing the curve from forming sharp peaks. Sloping the curve can be achieved by slowing the spread so that the number of cases of infection at one time can still be handled by available health facilities. Thus, risk people who are prioritized can get adequate services.[10]

Corona virus has a wide spread pattern and runs quickly, exceeding SARS or MERS. Control efforts have not been able to run effectively because the process of recognizing the virus is still running today.[10] Based on current epidemiological investigations, the incubation period for COVID-19 ranges from 1 to 14 days, and generally will occur within 3 to 7 days. Fever, fatigue and dry cough are considered the main clinical manifestations. Symptoms such as nasal congestion, runny nose, pharyngalgia, myalgia and diarrhea are relatively rare in severe cases, dyspnea and / or hypoxemia usually occur after one week after disease onset, and worse can quickly develop into acute respiratory distress syndrome, septic shock, metabolic acidosis is difficult to correct and bleeding and cough dysfunction and failure of many organs.[10]

Coronavirus is a round virus with a diameter of about 100-120 nm. Therefore, prevention of Coronavirus infection will be effective when using masks that are porous smaller than 100 nm. Coronavirus genome length ranges from 27 to 32 kilobases. This genome forms viral body building proteins such as phosphoprotein N, glycoprotein M, protein E, protein S, and glycoprotein HE, and proteins or enzymes that are necessary for replication of the virus itself.[10,11]

Patients with severe or critical illness may experience moderate to low fever, or no fever at all. Mild cases only present with a slight fever, mild fatigue and so on without manifestations of pneumonia.[11]

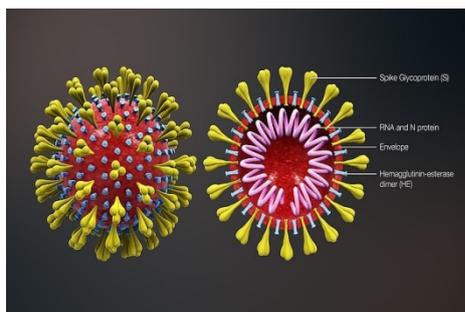


Fig.1. Structure of the Corona Virus

### III. CHARACTERISTICS OF EPIDEMIOLOGY

Case fatality rate (CFR) depends on the availability of health services, age and health problems in the population, and the number of undiagnosed cases. Preliminary research has resulted in case fatality rates between 2% and 3%; in January 2020. WHO concluded that the case fatality rate was around 3%, and 2% in February 2020 only in Hubei Province.[11] The WHO estimated the average infection fatality ratio (IFR, mortality among infected) to be around 0.8% - 0.9%. An observational study of nine people found no vertical transmission from mother to newborn. Also, a descriptive study in Wuhan found no evidence of transmission of the virus through sexual intercourse, but some experts noted that transmission during sex could occur through other routes.[11,12]

### IV. CLINICAL CHARACTERISTICS

The incubation period for COVID-19 is 1 to 14 days, and generally occurs on the third day to the seventh day. Fever, fatigue, and dry cough are common signs of corona infection accompanied by symptoms such as nasal congestion, runny nose and diarrhea in some patients.[12] Some severe patients have no obvious breathing difficulties and come with hypoxemia, so there are changes in guidance. In severe cases, dyspnea and / or hypoxemia usually occur after one week after disease onset, and worse can quickly develop into acute respiratory distress syndrome, septic shock, metabolic acidosis that is difficult to treat, and bleeding and dysfunction in coagulation, and etc. This edition emphasizes that patients with mild illness only experience mild fever, mild fatigue and so on, still without manifestations of pneumonia.[13]

This virus has positive RNA as its genome, and is usually often called an RNA virus. Viral mutations occur at the time of replication and RNA viruses mutate about 1 million times faster than DNA viruses. If the DNA virus has a mutation speed of 10-8 to 10-11 nucleotides each time the replication process, the RNA virus has a density of 10-3 to 10-4. Therefore, it cannot be denied that the virus that causes SARS is a mutated Coronavirus.[13] Most Coronaviruses only infect cells from their parent species and those closely related to their parent. In these stem cells, Coronavirus can only multiply in certain tissues. That is, the cells and tissues for breeding this virus are very specific. This specificity is determined by the nature and distribution of the receptor molecule from the cell and the variation of the "Protein S" sequence from the virus itself.[13,14]

Coronavirus replication takes place in the cytoplasm of cells and this virus can also multiply in cells that have already taken nucleus (enucleated cells). In experiments outside the body (in vitro), actinomycin D can inhibit the replication of Coronavirus in cells. But there are no studies on the effectiveness of these antibiotics clinically. Therefore, there is no decision whether antibiotics can suppress the proliferation of this virus in the human body.[15]

The Coronavirus replication process can be simply explained as follows. The virus first binds to cells through interactions between "Protein S" and receptors. After that the virus enters the cell and the viral RNA genome comes out of the viral membrane. Then part of the RNA genome functions as mRNA and partly as a template for negative RNA synthesis. The genome that functions as mRNA is translated into various proteins. Among these proteins, some are used to form the body of the virus and some are used to process RNA replication / multiplication.[15,16] While some other RNA genomes are used for negative RNA synthesis. This negative RNA is then used as a template for positive RNA synthesis. And so on this process takes place repeatedly. With this process, finally the positive RNA that becomes the genome will multiply. The positive RNA that has been multiplied is wrapped by viruses that make up the body of the virus, so new viruses are formed (progeny). This new virus finally comes out of the cell and has a function as a normal virus that can infect the next cell.[16]

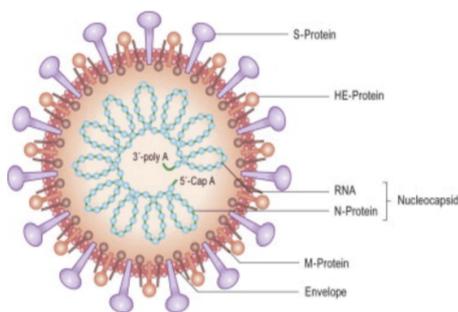


Fig.2. Corona Virus Structure Protein

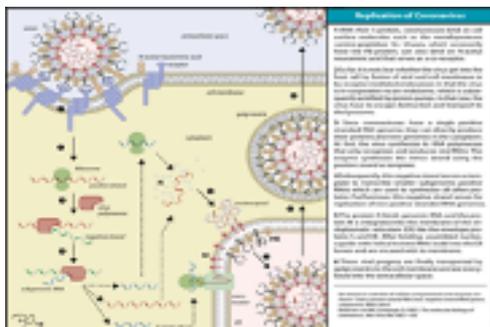


Fig.3. Corona virus replication, adapted from various sources

Coronavirus can only reproduce itself through its host cell. Viruses cannot live without host cells. Following the cycle of Coronavirus after finding host cells according to its tropism. First, the attachment and entry of the virus to the host cell is mediated by Protein S which is on the surface of the virus. S protein is the main determinant in infecting its host species and its tropical determinant. [16] In the SARS-CoV study protein S binds to the receptor in the host cell, the enzyme ACE-2 (angiotensin converting enzyme 2). ACE-2 can be found in oral and nasal mucosa, nasopharynx, lung, stomach, small intestine, large intestine, skin, thymus, bone marrow, spleen, liver, kidney, brain, pulmonary alveolar epithelial cells, small intestinal

enterocyte cells, endothelial cells venous arteries, and smooth muscle cells.[17] After successfully entering the next gene replication translation of the viral RNA genome. Furthermore replication and transcription where the synthesis of RNA viruses through translation and assembly of the virus replication complex. The next stage is the assembly and release of the virus. The following picture is the life cycle of a virus.[17]

In terms of laboratory examinations, the latest edition of the guidelines regarding COVID-19 adds the following explanation: "Increased levels of liver enzymes, LDH, muscle enzymes and myoglobin can occur in some patients; and elevated troponin levels can be seen in some critical patients and nucleic acid nCoV-2019 can be detected in biological specimens such as nasopharyngeal smears, sputum, lower respiratory tract secretions, blood and faeces.<sup>18</sup> In the initial stages of COVID-19, X-rays show that there are multiple small patches shadows and interstitial changes, especially in the peripheral lungs. As the disease progresses, the patient's x-ray results develop further into multiple ground glass shadows and infiltration shadows in both lungs. In severe cases, lung consolidation can occur. In patients with COVID-19, pleural effusion is rarely found.[17,18]

## V. SPREAD OF COVID 19

Since the first case in Wuhan, there has been an increase in COVID-19 cases in China every day and peaked between late January and early February 2020. Initially most reports came from Hubei and surrounding provinces, then increased to other provinces and throughout China. On January 30, 2020, there were 7,736 COVID-19 confirmed cases in China, and 86 other cases were reported from various countries such as Taiwan, Thailand, Vietnam, Malaysia, Nepal, Sri Lanka, Cambodia, Japan, Singapore, Saudi Arabia, South Korea, Philippines, India, Australia, Canada, Finland, France and Germany. The first COVID-19 was reported in Indonesia on March 2, 2020 in a number of two cases.<sup>9</sup> The March 31, 2020 data shows that there were 1,528 confirmed cases and 136 fatalities.<sup>10</sup> The COVID-19 mortality rate in Indonesia was 8.9%, this figure is the highest in Southeast Asia.[18,19]

Based on data obtained as of March 2020 there were 693,224 cases and 33,106 deaths worldwide. Europe and North America have become centers of the COVID-19 pandemic, with cases and deaths already surpassing China. The United States ranked first with the most COVID-19 cases with the addition of 19,332 new cases on March 30, 2020 followed by Spain with 6,549 new cases. Italy has the highest mortality rate in the world, which is 11.3%.[19]

TABLE I: DISTRIBUTION OF COVID 19 IN INDONESIA UNTIL  
MAY 03, 2020

Province	Total Case Date 03 May 2020	Total Case With Followup Specimen 2x Negative	Total of Case Died
Aceh	12	6	1
Bali	262	151	4
Banten	432	34	41
Bangka belitung	20	4	1
Bengkulu	12	1	1
Di yogyakarta	115	49	7
Dki jakarta	4463	632	398
Jambi	38	1	0
Jawa barat	1054	152	85
Jawa tengah	776	112	62
Jawa timur	1117	174	111
Kalimantan barat	70	8	3
Kalimantan timur	162	13	1
Kalimantan tengah	157	15	7
Kalimantan selatan	195	24	9
Kalimantan utara	122	5	1
Kepulauan riau	92	42	9
Nusa tenggara barat	269	36	4
Sumatera selatan	185	36	4
Sumatera barat	195	35	15
Sulawesi utara	45	17	4
Sumatera utara	123	41	13
Sulawesi tenggara	64	11	2
Sulawesi selatan	601	151	40
Sulawesi tengah	59	11	3
Lampung	50	17	5
Riau	53	26	5
Maluku utara	50	5	0
Maluku	23	12	0
Papua barat	43	0	1
Papua	240	48	6
Sulawesi barat	44	4	1
Nusa tenggara timur	10	1	0
Gorontalo	15	2	1
In Verification	24	0	0
Total	11192	1876	845

## VI. CHARACTERISTICS OF SUFFERERS

The Ministry of Health in the Preparedness Handbook for Coronavirus Disease groups the diagnosis of cases into 2 (two) groups, namely patients under surveillance and people under monitoring. People under monitoring are defined as someone who has symptoms of fever ( $\geq 38^{\circ}\text{C}$ ) or has a history of fever or ARI without pneumonia. In addition, someone who has a history of travel to a country affected by the last 14 days before symptoms appear is also categorized as a person in monitoring.[20]

People in monitoring must carry out self-isolation at home and take specimens (day 1 and day 2). Surveillance activities of people in monitoring carried out periodically to evaluate the worsening of symptoms for 14 days. Sampling of specimens was carried out by competent and experienced local laboratory personnel both at the health facility or

monitoring location.[19,20] Delivery of specimens was accompanied by an ODP / PDP examination form. If the test results show positive, the patient is referred to a referral hospital. Likewise, if the person in monitoring develops to meet the criteria of the patient under supervision in the last 14 days, then he or she is immediately referred to the referral hospital for further treatment.[19]

Patients under surveillance are defined as: 1. Someone who has a history of travel to the affected country 13 in the last 14 days before symptoms of COVID-19 occur and someone who experiences symptoms, including: fever ( $> 38^{\circ}\text{C}$ ); cough, cold and sore throat, mild to severe pneumonia based on clinical symptoms and / or radiological features; and patients with immune system disorders (immunocompromised) because symptoms and signs become unclear. 2. Someone who has a fever ( $> 38^{\circ}\text{C}$ ) or has a history of fever or mild to severe ARI AND in the last 14 days before symptoms develop, has one of the following exposures: a history of contact with confirmed cases of COVID-19, work or visit a health facility associated with patients with COVID-19 confirmation, have a history of travel to Hubei Province, have a history of contact with people who have a history of travel in the last 14 days to Hubei Province.[20]

## VII. RISK FACTOR

Based on existing data, comorbid hypertension and diabetes mellitus, male sex, and active smokers are risk factors for SARS-CoV-2 infection. More gender distribution in men is thought to be related to a higher prevalence of active smokers. In smokers, hypertension, and diabetes mellitus, there is thought to be an increase in ACE2 receptor expression.[20]

Other risk factors such as having a history in China or the region / country affected (according to disease progression, within 14 days before symptoms appear), close contact with the 2019-nCoV confirmation case, visiting health facilities in the country where the 2019-nCoV infection is related to home illness has been reported, contact with animals (if infectious animals have been identified) in a known country of the 2019-nCoV case circulating in animals or in humans due to animal transmission (zoonosis).[21,22]

Prevention and Control Factors: Until now there is no vaccine that can be used to prevent Covid-19 infection. Scientists continue to develop vaccines for the virus, even if the outbreak is over. Some countries such as America are trying to develop RNA and DNA-based vaccines, France modifies the measles vaccine so that it can be used for the Covid-19.23 virus. Some of the vaccines developed require a long time to be ready for use because they have to go through various clinical trials. Therefore, control efforts that can be done in a short time are doing preparedness. The preparedness step is inseparable from the principle of coping with outbreaks, namely the prevention phase, the detection phase, and the response phase. First, the prevention phase.[23,24] This phase is carried out among others by making preparedness guidelines that refer to the Health Outreach Act and the Infectious Disease Act so as to

support the implementation of global governance in managing outbreaks; convey a circular regarding Covid-19 prevention preparedness to provincial / district / city Health Services.[24]

The Port Health Office, and all hospitals; providing 2,322 masks; provide 860 personal protective equipment; provide 21 transport capsules for evacuation; alert 49 health offices; provide 100 referral hospitals to handle cases of infection due to Covid-19 accompanied by adequate human resources, facilities and infrastructure support; as well as simulating the handling of suspect Covid-19 patients, especially for hospitals that are designated as referral hospitals, as has been done in the hospital Dr. Moewardi Solo.[25] This phase has been carried out by the Government. In addition, to optimize the prevention phase, other efforts need to be made such as: establishing Covid-19 prevention posts; improve Communication, Education and Information (IEC) related to the virus so as not to cause panic in the community due to exposure to incorrect information; building a positive paradigm between stakeholders; and proactive in building public awareness so that they move in anticipating the spread of Covid-19.26 Meanwhile, the Commission IX and the Ministry of Health Working Meeting held on February 3, 2020 stated that cooperation and coordination with relevant ministries / agencies and local governments need to be increased in terms of efforts prevention and protection of health.[26]

The most effective prevention includes according to WHO, namely: 1. Maintain physical distance (at least 1 meter) with other people; 2. Frequently clean hands, using an alcohol-based antiseptic liquid if the hands do not look dirty or soap and clean running water when the hands look dirty; 3. Avoid touching the mouth, nose, and eyes; 4. Conduct ethics coughing and sneezing by covering the nose and mouth with folded elbows or tissue when coughing or sneezing and immediately removing the tissue after use; 5. use a medical mask if you experience symptoms of respiratory disease and clean your hands after removing the mask; 6. often clean and disinfect the surface of surrounding objects and other objects that are often touched.[27].

In health care facilities, key infection prevention and control (PPI) strategies to prevent or limit transmission of COVID-19 include: 1. Perform triage, early recognition and control of sources (isolate suspected and confirmed COVID-19 patients) 2. Apply standard precautions<sup>3</sup> for all patients including diligent hand hygiene. 3. Apply additional precautions (droplet alert and contact and airborne alert, if appropriate for procedures that produce aerosols and support treatments) for suspected and confirmed COVID-19 cases) 4. Implement administrative controls. 5. Using environmental and mechanical control.

## VIII. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment is a set of equipment that serves to protect its users from certain hazards or health problems, such as viral or bacterial infections. When used properly, PPE is able to block the entry of viruses or bacteria into the body through the mouth, nose, eyes, or skin. Ensure that PPE is used rationally and appropriately

PPE must be used in conjunction with administrative and mechanical controls. It is recommended that places, target recipients, exposure risks (for example, types of activities), and pathogen transmission dynamics (such as contacts, droplets, or aerosols) be used as a basis for indications of PPE use. Excessive use of PPE or misuse PPE will increasingly have an impact on lack of inventory.[28]

Following these recommendations means ensuring the rational use of PPE: 1. The type of PPE used when treating COVID-19 patients will vary depending on the situation, type of workforce, and activities. 2. Health workers involved in direct patient care must use PPE as indicated. 3. Specifically for procedures that produce aerosols and support treatments (tracheal intubation, noninvasive ventilation, tracheotomy, cardiac pulmonary resuscitation, manual ventilation before intubation, bronchoscopies) health workers must wear respirators, eye protection, gloves, and robes; Aprons should also be used if the robe is not watertight. 4. For the general public, people who experience symptoms that show COVID19 or who treat COVID-19 patients at home should get a medical mask and instructions for use. Further information can be seen in the home care guide for COVID-19 patients with mild symptoms and management of their contacts.[28]

SARS-CoV-2 is transmitted mainly through droplets. Personal protective equipment (PPE) is one of the effective methods of preventing transmission during rational use. The PPE component consists of gloves, face masks, protective goggles or face shields, and long-sleeved non-sterile gowns. Personal protective equipment will be effective if supported by administrative and environmental controls and techniques The use of PPE rationally is assessed based on the risk of exposure and the transmission dynamics of the pathogen. When interacting with patients without respiratory symptoms, there is no need for PPE.[29] If the patient has respiratory symptoms, keep a minimum distance of one meter and put the mask on the patient. Medical personnel are advised to use a complete PPE, such as a stethoscope, thermometer and spigmomanometer should be provided specifically for one patient. If it will be used for other patients, clean and disinfect with alcohol 70% .[28,29]

There are various efforts from various literatures that can improve the body's resistance to respiratory infections. Some of these include quitting smoking and alcohol consumption, improving sleep quality, and consuming supplements. Quitting smoking can reduce the risk of upper and lower respiratory tract infections. Smoking decreases the protective function of airway epithelium, alveolar macrophages, dendritic cells, NK cells, and the adaptive immune system. Smoking can also increase microbial virulence and antibiotic resistance.[30]

## IX. CONCLUSION

The COVID-19 phenomenon is a new problem for the world in the health sector. This disease is very worrying and needs to be aware of, this disease which has been declared a pandemic has a very fast pathogenesis, even the death rate due to this virus is quite high and the discovery of no definitive treatment in handling this problem. It is desirable

to study literature or other studies that can provide information related to COVID 19, so as to increase self-awareness in every human being in an effort to prevent or break the chain of transmission of this corona virus.

## REFERENCE

- [1] Kementerian Kesehatan RI. 2020. Pedoman Kesiapsiagaan Menghadapi Infeksi Novel Coronavirus (2019-nCoV). Jakarta.
- [2] Kementerian Kesehatan RI. "Kementerian Kesehatan Tegaskan Belum Ada Kasus di Indonesia", Suara Pembaruan, 27 Januari 2020, hal. 12.
- [3] Liu Y, Gayle AA, Wilder-Smith A, Rocklöv J. The reproductive number of COVID-19 is higher compared to SARS coronavirus. *J Travel Med.* 2020;27(2).
- [4] Xu,X.T.;Chen,P.;Wang,J.F.;Feng,J.N.;Zhou,H.;Li,X.;Zhong,W.;Hao ,P.Evolution of the novel corona virus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission. *Sci.China Life Sci.* 2020.
- [5] Wuhan Municipal Health Commission. Report on the Current Situation of Pneumonia in Wuhan (2020-01-11).
- [6] World Health Organization. Coronavirus disease 2019 (COVID-19) Situation Reports. Available online: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports> (accessed on 19 February 2020).
- [7] National Health Commission of the People's Republic of China and National Administration of Traditional Chinese Medicine. Diagnosis & Treatment Scheme for Novel Coronavirus Pneumonia (Trial) 6th Edition. Available online: <http://www.nhc.gov.cn/xcs/zhengcwj/202002/8334a8326dd94d329df351d7da8aefc2.shtml> (accessed on 19 February 2020).
- [8] Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020; 395:507-513.
- [9] Ki, M. and V.T. nCoV, Epidemiologic characteristics of early cases with 2019 novel coronavirus (2019-nCoV) disease in Republic of Korea. *Epidemiol Health*, 2020: p. e2020007.
- [10] Guan, Y., et al., Isolation and characterization of viruses related to the SARS coronavirus from animals in southern China. *Science*, 2003. 302(5643): p. 276-8.
- [11] WHO, Coronavirus disease (COVID-19) advice for the public: Myth busters. Available at (<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/mythbusters>). 2020.
- [12] Otter, J.A., et al., Transmission of SARS and MERS coronaviruses and influenza virus in healthcare settings: the possible role of dry surface contamination. *J Hosp Infect*, 2016. 92(3): p. 235-50.
- [13] Li G, Fan Y, Lai Y, Han T, Li Z, Zhou P, et al. Coronavirus infections and immune responses. *J Med Virol* 2020;92:424e32.
- [14] Fan YY, Huang ZT, Li L, Wu MH, Yu T, Koup RA, et al. Characterization of SARS-CoV-specific memory T cells from recovered individuals 4 years after infection. *Arch Virol*. 2009;154(7):1093-9.
- [15] Zhou P, Yang X-L, Wang X-G, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*. 2020;579(7798):270-3.
- [16] Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet*. 2020;395(10226):809-15.
- [17] Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *New Engl J Med.* 2020; published online February 28. DOI: 10.1056/NEJMoa2002032.
- [18] World Health Organization. Clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected. Geneva: World Health Organization; 2020.
- [19] Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*. 2020; published online March 20. DOI: 10.1016/S2468-1253(20)30084-4.
- [20] World Health Organization. Home care for patients with COVID-19 presenting with mild symptoms and management of their contacts. Geneva: World Health Organization; 2020.
- [21] World Health Organization. Coronavirus disease (COVID-19) advice for the public [Internet]. 2020 [cited 2020 March 15]. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>.
- [22] Roth DE, Richard SA, Black RE. Zinc supplementation for the prevention of acute lower respiratory infection in children in developing countries: meta-analysis and meta-regression of randomized trials. *Int J Epidemiol.* 2010;39(3):795-808.
- [23] Department of Health and Social Care, Public Health England. Coronavirus: latest information and advice . GOV.UK , 2020 . [www.gov.uk/guidance/wuhan-novel-coronavirus-information-for-the-public](http://www.gov.uk/guidance/wuhan-novel-coronavirus-information-for-the-public).
- [24] Chen N, Zhou M, Dong X et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020.
- [25] Rothe C, Schunk M, Sothmann P et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. *N Engl J Med* 2020.
- [26] Biggerstaff M, Cauchemez S, Reed C, Gambhir M, Finelli L. Estimates of the reproduction number for seasonal, pandemic, and zoonotic influenza: a systematic review of the literature . *BMC Infect Dis* 2014 ; 14 : 480.
- [27] Chan JF, Yuan S, Kok KH et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster . *Lancet* 2020.
- [28] Public Health England. Investigation and initial clinical management of possible cases of Wuhan novel coronavirus (2019-nCoV) infection. GOV.UK, 2020.
- [29] Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y, Li Y, Wang X, Peng Z. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA* 2020 Feb 7.
- [30] Momattin H, Al-Ali AY, Al-Tawfiq JA. A Systematic review of therapeutic agents for the treatment of the Middle East respiratory syndrome coronavirus (MERS-CoV). *Travel Med Infect Dis* 2019; 30: 9–18.