Literature Review

The use of artificial intelligence in new normal era against pandemic COVID-19 in the field of health services

Dian Agustin Wahjuningrum,[1*] Fery Setiawan,[2,3] Heni Puspitasari,[4] Setyabudi,[1] Ahmad Yudianto,[5] Agung Sosiawan,[6,7] Arif Rahman Nurdianto,[8] Swadheena Patro,[9]

[1] Department of Conservative Dentistry, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia
[2] Doctoral Program of Medical Science, Faculty of Medicine, Universitas Airlangga, Indonesia
[3] Department of Pathology Oral Maxillofacial, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia
[4] Toxoplasma study group, Institute of Tropical Disease, Universitas Airlangga, Surabaya, Indonesia
[5] Department of Forensic and Medicolegal, Dr. Soetomo General Hospital, Surabaya, Indonesia
[6] Department of Public Health, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia
[7] Department of Forensic Odontology, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia
[8] Lecturer in Universitas Anwar Medika, Sidoarjo, Indonesia
[9] Conservative Dentistry and Endodontics, Kalinga Institute of Industrial Technology, Bhubaneswar, Odisha, India

ABSTRACT

Background: *Indonesia is currently experiencing Coronavirus Disease-19 (COVID-19) pandemic which affects all sectors of life, therefore Indonesia is starting to prepare for New Normal era, including in health care sector. COVID-19 was previously known as novel Coronavirus Disease-19 (nCoV-19), where World Health Organization (WHO) declared it as a global pandemic in March 2020. New Normal era is an era of coexistence with COVID-19, resulting in new habits that were rarely or never practiced before. One practice that can be applied in health care sector is to use Artificial Intelligence (AI) to treat COVID-19 patients to prevent casualties for health workers. Health care providers are prone to contract aerosol and droplet transmission while treating patients, resulting in cytokine storm, acute respiratory distress syndrome (ARDS), and acute lung injury (ALI), which leads to death.* ***Purpose:*** *This mini review study used to explain the using of artificial intelligence in the new normal era against pandemic COVID-19 in the field of health services.* ***Reviews:*** *This pandemic COVID-19 restricts all of the communication between person to person. It also challenged the health service sector because the health service sector is the first line to combat the COVID-19. It is now popular to use artificial intelligence. This using can be used to help the health service sector in combating the COVID-19 pandemic especially in this new normal era.* ***Conclusion:*** *COVID-19 pandemic affects all aspects of life, especially health care sector, therefore AI use is important to prevent the deaths of health workers because of this pandemic.*

Keywords: *Artificial Intelligence (AI); COVID-19; New Normal; Health Care Sector; ARDS-SARS-CoV 2*

Correspondence: Dian Agustin Wahjuningrum, Department of Conservative Dentistry, Faculty of Dental Medicine, Universitas Airlangga, Jl. Mayjen Prof. Dr. Moestopo No. 47, Surabaya 60132, Indonesia. Email: dian-agustin-w@fkg.unair.ac.id

INTRODUCTION

Indonesia is currently experiencing Coronavirus Disease-19 (COVID-19) pandemic, which is the causative agent of Severe Acute Respiratory Syndrome Coronavirus Disease-2 (SARS-CoV-2). COVID-19 was declared a global pandemic by the World Health Organization (WHO) on March 2, 2020 and was previously known as the novel Coronavirus Disease-19 (nCoV-19). The International Committee on Taxonomy of Viruses (ICTV) refers to COVID-19 as SARS-CoV 2 because there are similarities between COVID-19 and two types of viruses that had been declared as pandemic before (Severe Acute Respiratory Syndrome-Coronavirus Disease-1 or SARS-CoV 1 in 2003 and Middle East Respiratory Syndrome-Coronavirus Disease or MERS-CoV in 2013). COVID-19 first broke out in Wuhan city, Hubei, China.[1-3] Wuhan is a seafood market linked to Huanan (located in southern China) and sells a wide variety of animals: raccoons, bats, snakes, raccoons, and many other kinds of animals. At that time, an outbreak of a new disease called the novel Corona Virus-19 (COVID-19) was reported, causing unprecedented pneumonia cases.[4-6]

Currently, there are approximately sixty-five countries infected by corona virus and because of its rapid transmission, the World Health Organization (WHO) has declared it as a global pandemic. SARS-CoV 2 infection cases globally as of February 2021 approximately reached 103.377 million cases (an increase of 6.192 million cases),

where 57.3 million people recovered, and 2.24 million people died. Five countries with the highest cases of SARS-CoV 2 infection were: United States, Brazil, Russia, India, and United Kingdom. In the early of February 2021, there were 1.1 million cases in Indonesia, where 896.530 people recovered, and 30.581 died, with infection cases in Indonesia being the five highest number of cases in Southeast Asia after India, Iran, Bangladesh, Arab Saudi, and Indonesia. The five (5) locations with the most cases of SARS-CoV 2 infection in Indonesia consist of: Jakarta, West Java, Central Java, East Java, East Kalimantan, and Bali. Inspite of these cases, all of the worlds are being vaccinated using: Sinovac, Pfizer-BioNTech, and the other brandmarks. Indonesia began this vaccinated program on 13 January 2021 until now there are 646.026 health workers have been vaccinated. SARS-CoV 2 infection incidence that leads to death is exacerbated by the presence of chronic comorbid diseases (heart disease, cerebrovascular disease, Diabetes Mellitus, cancer, and other chronic diseases). The fallen victims did not only come from regular citizen, but could also from Doctors and Nurses who were at the forefront of treating COVID-19 patients. Surabaya branch of the Indonesian Doctors Association (IDI) has noted that at least 504 doctors in East Java were infected with COVID-19 and two hundred and thirty seven doctors died from COVID-19. Meanwhile, one hundred forty-six nurses were also infected with COVID-19 and eleven of them died.[7-9]

Casualties from health workers is caused by various types of procedures both in Medicine and Dentistry that encourage airborne transmission (aerosolized droplet and droplet transmission), for example: suctioning, bronchoscopy, tracheostomy, cardiopulmonary resuscitation and dental procedures (using a high speed handpiece and cleaning the tartar using an ultrasonic scaler). Airborne transmission can also be found when a person breathes normally, where an overlap often occurs between respiratory particles and droplets or aerosols. Aerodynamic diameter and particle size are the two main things used to distinguish between respiratory particles, droplets and aerosols. Aerosols have a greater potential risk in COVID-19 transmission process from an infected person to a susceptible person, even though they are located far from the infected person. SARS-CoV-2 can be isolated from saliva and it is further stated that the salivary gland epithelial cells are potentially infected with viruses and become the largest source of viruses found in saliva, therefore they might cause cross-infection between doctors/dentists-patients, patient doctors/dentists, and a patient with another patient in the doctor/dentist care unit. Furthermore, health workers will be infected with COVID-19 and become one of the following groups: people without symptoms who are changed into asymptomatic confirmed cases, people under supervision who are changed into suspected cases, patients under supervision who are changed into probable cases, and confirmed COVID-19, which in a severe state Acute Respiratory Distress Syndrome (ARDS) and Acute Lung Injury (ALI) might occur, which might trigger sepsis, cytokine storm and multi-organ failure that cause death. There is no specific health protocol that can be carried out in a medical/dental practice other than a protocol to avoid Aerosol Generating Procedures (AGPs) through the use of level 3 Personal Protective Equipment (PPEs) and limiting the number of patients to minimize COVID-19 cross-infection.[10-13]

Artificial Intelligence (AI), which in Indonesian is often referred to as intelegensi artifisial or kecerdasan buatan, is an intelligence that can be added to a system that can be regulated in a scientific context, and that context is different from natural intelligence in humans. AI subjects relate to a computational model that can think and act rationally, which can be a copycat system with human cognitive functions and is related to human thoughts, such as learning and solving problems, making AI possible to solve problems.[14] AI was originally used to solve problems related to chess and language recognition, but with massive development of technology, AI can be considered to replace work that can be done by humans, which is a form of service in New Normal era of health care in hospitals, which can temporarily replace the role of health workers in treating COVID-19 patients to reduce the possibility of Doctors and Nurses to contract COVID-19 from patients.[15] Currently, Reproductive Number (Ro) value for COVID-19 is still high with Ro = 2.24-3.58[10,13]. If Ro value is greater (>) than 1, according to epidemiological data, there is a possibility of an epidemic and an outbreak. Ro value for COVID-19 = 2.24-3.58, meaning that one person with COVID-19 can infect two to four healthy people in their surroundings.[16]

New Normal is a new era which is a consequence of living side-by-side with COVID-19 because COVID-19 affects all sectors of life, including economic, health, and financial sectors. In New Normal era, it will bring the use or the start of new habits that in previous era were rarely or even never been done before, for example: the use of AI (both in the form of robots and other forms of scientific intelligence) in health sector to treat COVID-19 patients, intensive use of masks when doing activities outside, Work From Home, implementing social/physical distancing policies that aim to break the chain of COVID-19 transmission.[17-19]

REVIEWS

Several virus types that cause respiratory tract infection are influenza viruses, rhinovirus, coronavirus, respiratory syncytial viruses (RSVs), and parainfluenza virus. SARS-CoV 2 is a part of coronavirus family and is similar to two types of diseases that broke out in 2002 and in 2012, therefore based on the correlation between the two types of viruses, the similarity level between SARS-CoV2 and SARS-CoV was 88% (derived from the same chart), while the similarity level with MERS-CoV was 50%. The three types of viruses (SARS-CoV 1, MERS-CoV, and SARS-CoV 2) originate from Bat Corona virus group, with the difference being that SARS-CoV 1 and SARS-CoV 2 are in one tree from Bat Coronavirus BM48-31, while MERS-CoV is on another tree from Bat coronavirus HKU5-1.

Table 1. Differences between SARS-CoV 1, MERS-CoV, and SARS-CoV 2.[20]

Characteristic	SARS-CoV 1	MERS-CoV	SARS-CoV 2
Human Receptor	Angiotensin Converting Enzyme -2 (ACE-2)	Dipeptidyl Peptidase-4 (DPP-4)/Cluster of Differentiation 26 (CD 26)	Angiotensin Converting Enzyme-2 (ACE-2)
Manifestation	Cough, fever, malaise, difficulty breathing	Pneumonia, respiratory injury	Cough, fever, and difficulty breathing
Disease	Severe Acute Respiratory Syndrome (SARS), Acute Lungs Injury (ALI), Acute Respiratory Distress Syndrome (ARDS)	Middle East Respiratory Syndrome (MERS)	Severe Acute Respiratory Distress Syndrome 2 (SARS 2), Acute Lung Injury (ALI), Acute Respiratory Distress Syndrome (ARDS), Coronavirus Disease-19 (COVID-19)
Place and year when pandemic occurred the first time	Guangdong, China in 2002	Saudi Arabia in 2012	Wuhan, Wubei China in 2019
Mortality	776 (9.6%)	838	4473 (3.61)
Transmission	9% of 26 countries	-	2.9% of 109 countries
Main animal reservoir (Zoonosis)	Bat	Bat	Bat
Intermediate animal reservoir (Zoonosis)	Civet	Camel	Pangolin

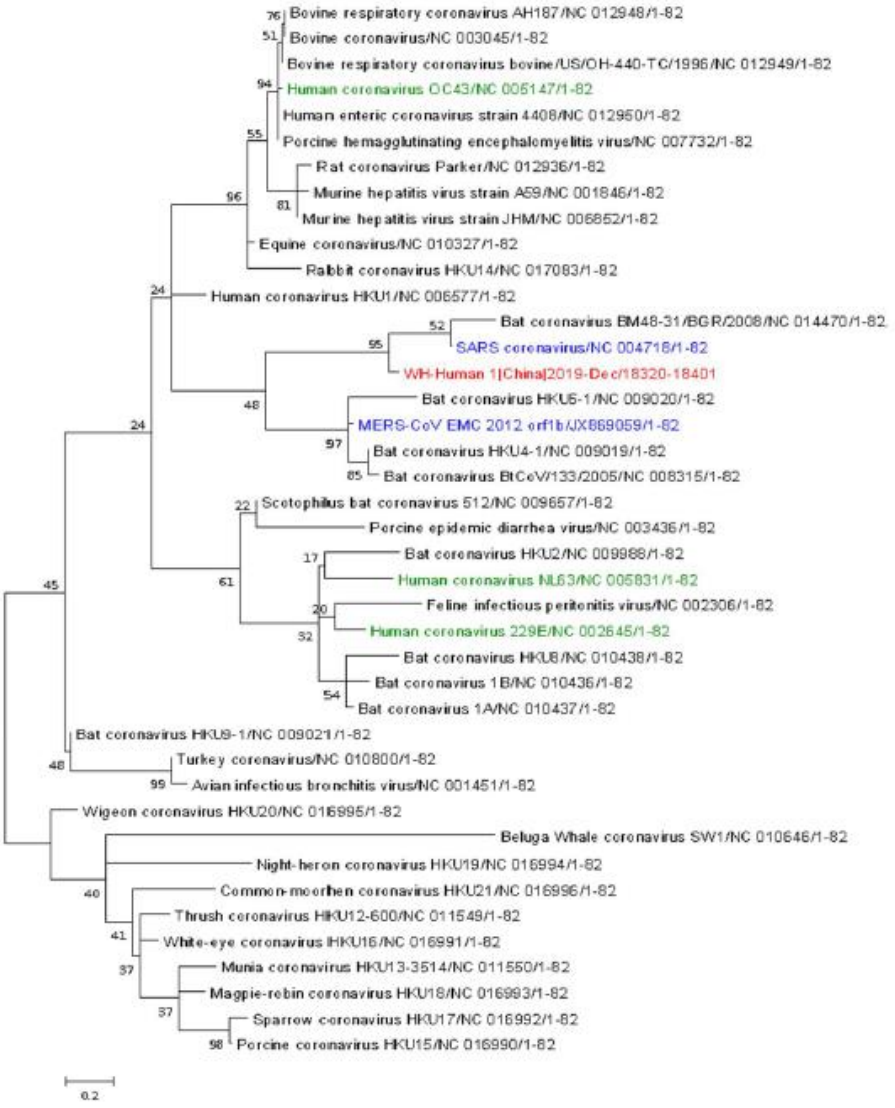

Figure 1. Phylogenetic tree between SARS-CoV 2, SARS-CoV 1, and MERS-CoV.[21]

Based on the phylogenetic tree of virus analysis in Figure 1, COVID-19 is a mutated form of both the SARS-CoV and MERS CoV viruses.[21]

This is based on the fact that SARS-CoV 2 is a member of Corona virus family, which is a group of RNA viruses (β coronavirus) with a diameter between 50-150 nm. Corona viruses are easily mutated and divided into several types: α, β, γ, and δ Co-V. COVID-19 infection is a zoonotic infection transmitted from intermediate animals, which are bats (Horseshoe Bat, Rhinolopus sinicus species) and pangolin. Coronavirus is infectious in several species of mammals (α and β CoV) and also to avian/bird species (γ and δ CoV). Coronavirus virus attacks the upper respiratory tract in humans, the types are: α-CoV, HCoV 229E, HCoV NL 63, β-CoV, HCoV-HKU1, and HCoV OC 43 with symptoms similar to common colds.[5,13,22,23] COVID-19 infection incidence is often found in male patients with an age ranges from 34 to 59 years. The incidence of this infection is also exacerbated by chronic comorbid diseases (heart disease, cerebrovascular disease, and diabetes). The highest proportion of cases was suffered by people over 60 years and have comorbid diseases. The incidence in children under 15 years is extremely rare. There are several patient terms related to COVID-19, which are: People Without Symptoms (OTG), People Under Supervision (ODP), Patients Under Supervision (PDP) or suspected cases, and patients confirmed with COVID-19 with each of these criteria will be presented in Table 2.

SARS-CoV 2 is a single stranded RNA (ssRNA) virus class, meaning that the only viral genetic material content is RNA. RNA virus group is a virus that is easily mutated. Judging from the differences with SARS-CoV virus, SARS-CoV 2 virus has the same hijacking site, which is ACE-2, but in SARS-CoV 2, it is associated with ribosome which is the site of protein synthesis through transcription-translation stage. This is the initial basis for SARS-CoV 2 transmission process, both in sick individuals and in corpses who were positive with corona virus to the surrounding environment. Corona virus must be attached to host cell, because without being attached to host cell, corona virus is an inanimate object called an obligate parasite.[24-26]

DISCUSSION

SARS-CoV 2 causes infection in built environments (BEs), where BEs and contact points generally consist of 2 modes: direct and indirect modes. COVID-19 transmission through contact points is presented in Table 3. BE is a concept which explains that humans live in contact with and are related to the surrounding environment. COVID-19 might attach objects' surfaces which can be presented as Tissue Culture Infectious Disease-50 (TCID50) per millimeter on several types of materials, such as: aluminum plastic (stainless steel), cooper, and cardboard, as shown in the Table 2. SARS-CoV 2 virus is more stable in plastic and aluminum (stainless steel) materials compared to copper and cardboard materials, where it might be able to live up to 72 hours. TCID50 titer of SARS-CoV 2 virus on plastic and aluminum material will decrease, from TCID50 of 103.7 to 100.6 per millimeter for 72 hours on plastic material and with the same results for 48 hours on aluminum material surface, while on copper and cardboard there was no TIDC50 SARS-CoV 2 virus for a period of 4 hours to 8 hours. In addition, the half-life values for the viral spread in airborne medium (aerosol) of SARS-CoV-2 and SARS-CoV-1 were similar, with a median of about 1.1 to 1.2 hours and a 95% credible interval of 0.64 to 2.64 for SARS-CoV-2 and 0.78 to 2.43 for SARS-CoV-1.[16,27,28]

Direct mode transmission might occur through aerosol, droplet, splatter and self-inoculation of nasal mucosa, mouth, and conjunctiva by hand. For indirect mode, transmission might occur through items that are touched (directly or indirectly) and used to examine COVID-

Table 2. Difference between OTG, ODP, PDP, and COVID-19 confirmed.[11]

Asymptomatic-confirmed	Suspected	Probable	COVID-19 confirmed
People who are asymptomatic and at risk of being infected from COVID-19-confirmed patients.	A person with fever		
(>38°C) or history of fever or with respiratory symptoms (flu/cough/sore throat) and in the last 14 days had a history of travel or stay in a country/area who reported local transmission	A person with acute respiratory tract infection that is accompanied with one of respiratory diseases and in the last 14 days before symptoms appear had a history of travel or stay in a country/area who reported local transmission	A COVID-19-infected patient with positive result of swab test through Polymerase Chain Reaction (PCR) examination	
Close contact is when a person who physically contacted or being in the same room or visit in 1 meter radius a suspected or confirmed patient in the last 2 days before symptoms appear or 14 days after symptoms appear	A with respiratory symptoms (flu/cough/sore throat) and in the last 14 days before symptoms appear had a history of close contact with a COVID-19-confirmed patient	A person with fever or acute respiratory tract infection or history of fever and in the last 14 days had a history of close contact with a COVID-19-confirmed patient	

19 patients, for example: a thermometer to check body temperature and a stethoscope used to check heart rate.[12,17] WHO distinguishes direct mode of infection into droplet and aerosol transmissions. Droplets consist of three types: large infectious droplets, small infectious droplets, and droplet nuclei (bioaerosol). Droplets and aerosolized droplets that are released by a patient through sneezing, coughing and exhaling have different maximum speeds and distances. Droplets and aerosolized droplets during sneezing can be ejected up to 6 meters at a speed of 50 m/s in 0.12 seconds. Droplets and aerosolized droplets in coughing can be ejected up to 2 meters at a speed of 10 m/s in 0.2 seconds, whereas during exhale they can only be ejected up to 1 meter at a speed of 1 m/s in 1 second. The terms droplet transmission and airborne transmission also have a difference, with the difference being that droplet transmission occurs when bacteria or viruses are released simultaneously during sneezing or coughing process. Droplet transmission occurs over a very short distance (less than 2 meters or about 1.5 meters). In droplet transmission, there might be particles that are infectious and might infect other people around by entering oral, nose, or conjunctival mucosa of the eye and might reach the upper respiratory tract. Airborne transmission occurs when bacteria or viruses have become droplet nuclei, causing it to have the same characteristics as droplet nuclei and might be inhaled into lower respiratory tract. Social distancing concept arises based on the fact that droplets can be ejected as far as 1.5 meters when a person is walking or running. Procedures that are potential to generate all forms of droplet transmission and aerosolized droplet might occur in the world of medicine and dentistry, where this script focuses on the world of dentistry and forensic autopsy. The world of dentistry produces many droplets through cleaning tartar, the use of a bur (handpiece), which might lead to cross-infection from patient to dentist, dentist to patient, and from a patient to another patient while in dentist waiting room or in dental practice room.[12,17,29]

Table 3. COVID-19 virus transmission contact pattern.[16]

Contact point	Transmission point
Milk bottle or daily morning newspaper	Milkman or paperboy who are under supervision or asymptomatic that deliver the good every morning
Elevator/Escalator buttons	People and patients under supervision or asymptomatic people who touch the buttons
Handles in public facilities and transportations	People and patients under supervision or asymptomatic people who touch the handles
Door bell	People and patients under supervision or asymptomatic people who touch the door bell
Fruits/vegetables that are sold at the market	People and patients under supervision or asymptomatic people who touch the displayed fruits/ vegetables
Shopping bag at the market	People and patients under supervision or asymptomatic people who touch the shopping bag
Cafeteria	People and patients under supervision or asymptomatic people who visited the crowd at the cafetaria
Public toilet	People and patients under supervision or asymptomatic people who used the toilet
Note/bill	People and patients under supervision or asymptomatic people who touch the note/bill
Clothes	Clothes that are worn by people and patients under supervision or asymptomatic people
Door knob/handle	People and patients under supervision or asymptomatic people who touch the door knob/handle

Splatter is one of SARS-CoV 2 transmission modes between humans. When a person is talking, it is thought that splatter is a virus that comes out along with saliva drops (saliva and fluids) during talking. This splatter is ballistic because it is produced with a certain force from one place to another which is similar to bullet trajectory until it hits a surface. These particles are larger than droplets, only reach a short distance of less than 1 meter, and remain in the air for a short time. Saliva is suspected to contain a very high viral load, containing 1-1.2 x 108 copies of virus/ml in saliva and is often detected at viral infection onset of symptoms. This is because ACE 2 is found not only in the lungs, but also in oral cavity, tongue and salivary glands.[13,30]

Airborne transmission or droplet transmission patterns might occur in public transportation and places, because there is a direct interaction between the passenger and the driver. Some examples of public transportation that are of concern in airborne transmission and droplet transmission process are in buses, airplanes and trains. The three modes of transportation require passengers in them to remain inside for a long period of time (at least 10 hours) and this is exacerbated by air conditioner (AC) that is associated with air circulation which can aggravate and accelerate transmission process. Public places that become the focus of attention in virus transmission are health care units, such as in hospitals.[12]

Autopsy protocol on a corpse that is COVID-19 confirmed is conducted with a fairly complicated procedure. The protocol consists of the following procedures: The autopsy process must be carried out 12 hours after death in a specific room that has a high level of biosafety (using aerosol-generating procedures-AGPs). Before autopsy process, the body is stored in a room temperature of 4-8℃. During autopsy process, a minimum number of personnel was carried out and each person used a triple N95 mask (3). Autopsy process of a corpse starts from the abdomen, pelvic area, and head followed by the chest area, and the last part is the cranium. Autopsy is performed on an autopsy bag. The organs that need extra attention during autopsy process are respiratory organs (proximal and distal trachea, right and left lung bronchi, right and left lungs). After autopsy process is complete, all equipment that is used during autopsy process is decontaminated using 0.5% iodine solution for three minutes, all fluids coming from the

body are washed with 0.05% iodine solution. All specimen materials collected during autopsy process are collected and fixed in formaldehyde solution and carefully wrapped using two types of non-absorbent containers.[31]

Four main structures in corona virus are: protein N (nucleocapsid), glycoprotein M (membrane), glycoprotein S (Spike), and envelope protein E. All of these main structures are encoded in the three ends of viral genome and are included in Open Reading Frames 1a/1b (ORFs-1a/1b).[22,31] The main receptor sites for COVID-19 binding are Angiotensin Converting Enzyme-2 (ACE-2) receptors, which are mostly found in respiratory tract. The bond between COVID-19 and ACE-2 is mediated by ORFs-1a/1b in spike 1 (S1) protein, and if these bonds match, COVID-19 invasion process into the host cell is mediated by spike 2 protein (S2). The main objective of the invasion process is the rough endoplasmic reticulum (RER), because RER contains ribosomes that play a role in transcription-translation process for viral genome synthesis and replication.[32,33]

Figure 2. COVID-19 molecular pathogenesis scheme and its correlation with cytokine storm production which causes organ damage.[34] Figure 2 shows S2 invasion process, where the host body gives resistance using natural immunity through dendritic cells. Antigen Presenting Cell (APC) presents antigens to B and T cells.[34,35] Dendritic cells have the ability to provoke B and T cells, elevating cytokine secretion which aim to eliminate the antigens that is present and antigen that enters the cells. The cytokines that are secreted include: MIP-1α, Interferon, IL-1β, IFN-γ, IP-10, MCP-1, IL-4, IL-10, IL-2, IL-7, GCSF, and TNF-α. The chemokines that are secreted include: CCL-2, CCL-3, CCL-5, CXCL-8, CXCL-9, and CXCL-10[12]. COVID-19 has the ability to live in B and T cells, especially CD8 +, therefore that the body's immune system continues to produce cytokines, resulting in chemokines overproduction. The excess production of these chemokines has a negative impact on lung, because COVID-19 attacks the lung and causes Acute Lung Injury (ALI), where one form of ALI is Acute Respiratory Distress Syndrome (ARDS) and sepsis. The characteristics of ARDS are pulmonary edema, severe hypoxic state, and inflammatory cells accumulation in the lungs which might lead to death.[35-37]

Laboratories that carry out COVID-19 specimens' examinations must pay attention of biosafety and bio risk concepts. The four main pillars of biosafety concept are leadership, Standard Operating Procedures (SOP), Personal Protective Equipment (PPE), and Engineering controls. The focus of leadership relates to specimen collection to COVID-19 examination samples destruction, with each stage having to be carefully considered to reduce the potential risks that might occur. This concept stated that a pathologist, laboratory director, investigative leader, laboratory manager are workers who each have a leadership spirit for all stages of examination in the laboratory. SOPs are documents that are taped and placed on workbench and on laboratory walls. All work in the laboratory must uphold in accordance to existing SOPs. PPE is personal protective equipment that must be worn when handling infectious samples related to COVID-19 samples. COVID-19 is classified as a level 3 bio risk material, therefore PPE that are used include: disposable laboratory gowns, face masks (N95 masks and head caps), disposable gloves, footwear covers, protective eyewear, shoe covers, and biosafety cabinet class II type II. The fourth pillar in terms of laboratory biosafety for COVID-19 is laboratory structure, air conditions and air movement in the laboratory, and personnel in the laboratory. The laboratory structure plays an important role for the safety of all personnel in the laboratory, given that COVID-19 is closely related to droplets and aerosolized droplets transmission and might move from one place to another.[38-41]

COVID-19 pandemic will create a new era (New Normal), and in this era people will live side by side with COVID-19 until anti-COVID-19 vaccine has already been given. COVID-19 affects all aspects of life, including aspects of health, finance, education, and many more. In this new era, people will begin to get used to new habits, such as: using masks for every activity outside, not touching face areas when doing activities outside, implementing social distancing/physical distancing policies, avoiding crowds and places (Large-Scale Social Restrictions/PSBB), improve hygiene and personal hygiene in the surrounding environment both after activities outside and when returning to home, and traveling as less as possible (working from home). In financial world policy, New Normal era can be started by using electronic money and minimizing the use of cash to meet daily needs. In health policy, New Normal era can be started by using Personal Protective Equipment (PPE), face shields, and the use of artificial intelligence for health sector services.[17-19]

AI is intelligence that can be added to a system and might be regulated to a scientific context, and that context is different from natural intelligence in humans. AI subjects relate to a computational model that can think and act rationally, which might be a copycat system with human cognitive functions and is related to human mind, such as learning and solving problems.[14] The concept of AI is a combination of science concept and technological developments, one of which is to overcome COVID-19 pandemic during a certain period and cause global panic. The scope of AI use might be in the form of COVID-19 data accumulation analysis (through CORD-19 dataset, COVID-19 cases data, COVID-19 cases data and analysis in hospitals), prediction of SARS-CoV 2 immunogenic section to find COVID-19 vaccine blueprint, prediction, prevention, warning of hazards, diagnosis and treatment of COVID-19, and social control on COVID-19.[42-49] The reason for using AI is to minimize direct or indirect contact with COVID-19 patients, therefore reducing or preventing transmission risk to health workers.

The large number of casualties both from patients and health workers who are infected when they treat COVID-19 patients requires an approach to prevent fatalities from health workers. Patients and hospitals both have three zones: green, yellow, and red zones. Patients in green zone are a group

of patients who do not have symptoms of fever, respiratory problems, and no travel history to countries/regions that report local transmission. Patients in yellow zone are a group of patients who have traveled, and have had contact with a confirmed case of COVID-19, and or have experienced any of the symptoms of such as fever, respiratory problems, and other symptoms related to COVID-19 symptoms. Patients in red zones are patients with symptoms of fever, severe pneumonia (in the form of difficulty breathing), have close contact with confirmed cases of COVID-19, and live in areas where local transmission is reported.[11]

The zones in a hospital (particularly Infectious Disease Hospital) also consist of green, yellow, and red zones. The green zone is located in the stairwell, linen warehouse, doctor's room, and elevators that are not traversed by COVID-19 patients. The yellow zone is located in the area where COVID patients pass, which might be the Emergency Room (ER), outpatient room and patient waiting room. The RSPTI red zone is located in rooms that are used to treat COVID-19 patients and is often a source of transmission for health workers.

The role of disinfection process in a room with red and yellow zones can be replaced by Artificial Intelligence, because one of Artificial Intelligence functions is to be used as disinfection tool. The disinfection process here might use an AI robot or a drone that has been previously filled with disinfectant, thereby reducing the contamination risk for health workers from the environment in red and yellow zones. In addition, as previously mentioned, laboratories that examine COVID-19 specimen samples are classified as Bio risk level 3, which requires attention and specialization to prevent leakage and transmission in the process of receiving and sending specimen, and during room decontamination process. COVID-19 might remain in some materials that are in the laboratory room.[26,39,40,42]

AI can also be used as an early diagnostic tool, considering that in a confirmed patient or PDP, pneumonia already occurs which gives more risk for health workers to examine the patients, because close contact between health workers and patients might occur. This procedure might be replaced by AI which might be programmed to replace the role of health workers to diagnose and perform lung photographs. AI can also be used to find candidates for COVID-19 vaccine blueprint because AI is able to determine COVID-19 antigenic side. AI can also be used as a tracing tool against people who have had contact with confirmed patients or with OTG, ODP, and PDP status. This is done by using a CCTV camera that can be placed in the room. CCTV has the ability for face recognition process, thereby it might know who has been in contact with confirmed patients, making tracing easier.[43,44,49]

ACKNOWLEDGEMENT

Gratitude is due to all of the journals, ebook, and to Alm. Prof. Dr. Jenny Sunariani, drg., MS., AIFM., PBO as a Biology Oral Professor in Faculty of Dental Medicine Universitas Airlangga which has inspired the author and co-authors.

REFERENCES

1. Li X, Geng M, Peng Y, Meng L, Lu S. Molecular immune pathogenesis and diagnosis of COVID-19. Journal of Pharmaceutical Analysis.2020: 1-17.
2. Mourya DT, Sapkal G, Yadav PD, Belani SKM, Shete A, Gupta N. Biorisk assessment for infrastructure & biosafety requirements for the laboratories providing coronavirus SARS-CoV-2/(COVID-19) diagnosis. Indian J Med Res. 2020; 151:172-176.
3. Meng L, Hua F, Bian Z. Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine. Journal of Dental Research. 2020: 1-7
4. Bhatia R, Chaudary R, Khurana SK, Tiwari R, Dhama K, Gupta VK, et al. Strengthening og Molecular Diagnosis of SARS-CoV-2 / COVID-19 with a Special Focus in India. J Pure Appl Microbiol; 14(1):789-798.
5. Susilo A, Rumende CM, Piloyo CW, Santoso WD, Yulianti M, Herikurniawan, et al. Coronavirus Disease 2019: Tinjauan Literatur Terkini. Jurnal Penyakit Dalam Indonesia. 2020;7(1): 45-67.
6. Ciotti M, Angeletti S, Minieri M, Giovanetti M, Benvenuto D, Pascarella S, et al. COVID-19 Outbreak: An Overview. 2020. Chemotherapy: 1-9.
7. Wikipedia. COVID-19 pandemic data. 2020. https://en.wikipedia.org/wiki/Template:COVID-19_pandemic_data (Accessed: 28 June 2020)
8. Kementerian Kesehatan Indonesia. Dashboard kasus COVID-19 di Indonesia. 2020. Available from: https://www.kemkes.go.id/article/view/20031900002/Dashboard-Data-Kasus-COVID-19-di-Indonesia.html. Accessed 2020 July 6.
9. Dinas Kesehatan Kota Jakarta. Data pantauan COVID-19 Jakarta. 2020. Available from: https://corona.jakarta.go.id/id. Accessed 2020 July 6.
10. Zhou Y, Fu B, Zheng X, Wang D, Zhao C, et al. Pathogenic T Cells and inflammatory monocytes incite inflammatory storm in secere COVID-19 patients. Downloaded from https://academic.oup.com/nsr/advance-article-bstract/doi/10.1093/nsr/nwaa041/5804736 by Kangwon National University, Samcheok Campus user on 21 March 2020
11. Keputusan Menteri Kesehatan Republik Indonesia No. HK.01.07/MENKES/413/2020 2020 Pedoman Pencegahan dan Pengendalian Coronavirus Disease-19 (COVID-19)
12. Jayaweera M, Perera H, Gunawardana B, Manatunge J. Transmission of COVID-19 virus by droplets and aerosols: A critical review on the unresolved dichotomy. 2020;Environt Res; 188: 1-19.
13. Hudoyono R, Bramantoro T, Benyamin B, Dwiandhono I, Soesilawati P, Hudyono AP, et al. During and post COVID-19 pandemic: prevention of cross infection at dental practices in country with tropical climate. 2020; Dent J MKG; 53(2):108-114.
14. Perez JA, Deligianni F, Ravi D, and Yang GZ. Artificial Intelligence and Robotics. 2017. UK-RAS Network Robotics and Autonomous Systems UKRAS.ORG
15. Dananjayan S, Raj GM. Artificial Intelligence during a pandemic: The COVID-19 example. Int J Health Plann Mgmt. 2020:1-3.
16. Faiq MA, Kumar A, Singh HN, Pareek V, Qadri R, Raza K, et al. COVID-19: A review on molecular basis, pathogenic

mechanisms, therapeutic aspencts and future projections. Preprints. 2020;1:1-29.
17. World Health 2020 Organization Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations.
18. Reid J 2020 Deutsche Bank Research konzept (Deutsche: Deutshce Bank Research)
19. Setiawan FS, Yudianto A, Mooduto L, Sunariani J. New Normal to Achieve High Treshold Herd Immunity by (Ro and Pc) Post Pandemic COVID-19. Malaysian Journal of Medicine and Health Sciences. 2021; 17 (2): 141-145
20. Shereen MA, Khan S, Kazmi A, Bashir N, Siddique R. COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses. JARE. 2020; 24: 1-8.
21. Turista DDR, Islamy A, Kharisma VD, Ansori ANM. Distribution of COVID-19 and Phylogenetic Tree Construction of SARS-CoV-2 in Indonesia. J Pure Appl Microbiol. 2020; 14(1):1035-1042.
22. Sahin AR, Erdogan A, Agaoglu PM, Dineri Y, Cakirci AY, et al. Review: 2019 Novel Coronavirus (COVID-19) Outbreak: A Review of the Current Literature. EJMO. 2020;4(1): 1-7.
23. Guo YR, Cao QD, Hong ZS, Tan YY, Chen SD, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status. Military Medical Research. 2020; 7(1): 1-10.
24. Suprobowati OD, Kurniati I. Bahan Ajar Teknologi Laboratorium Medik (LTM) Virologi. Kementerian Kesehatan Republik Indonesia Pusat Pendidikan Sumber Daya Manusia Kesehatan. 2018. Available at: http://bppsdmk.kemkes.go.id/pusdiksdmk/wp-content/uploads/2018/09/Virologi_SC.pdf. (Accessed at 28 June 2020)
25. World Health Organization. 2020. Infection Prevention and Control for the safe management of a dead body in the context of COVID-19. Available at: https://apps.who.int/iris/bitstream/handle/10665/331538/WHO-COVID-19-lPC_DBMgmt-2020.1-eng.pdf (Accessed: 11 April 2020)
26. The Royal College of Pathologists. (2020) Transmission-based precautions Guidance for care of deceased during COVID-19 pandemic. Available at: https://www.rcpath.org/uploads/assets/0b7d77fa-b385-4c60-b47dde930477494b/G200-TBPs-Guidance-for-care-of-deceased-during-COVID-19-pandemic.pdf (Accesed: 11 April 2020)
27. Dietz L, Horve PF, Coil D, Fretz M, Eisen J, et al. 2019 Novel Coronavirus (COVID-19) Outbreak: A Review of the Current Literature and Built Environment Considerations to Reduce Transmission. Preprints. 2020: 1-35.
28. Holbrook MG, Gamble A, Williamson BN, Tamin A, Harcourt JL, et al. Aerosol and Surface Stability of SARS-CoV 2 as Compared with SARS-CoV 1. The New England Journal of Medicine. 2020: 1-3.
29. Blocken B, Malizia F, Druenen Tv, Marchal T 2020 Towards aerodinamically equivalent COVID-19 1.5 m social distancing for walking and running
30. Xu H, Zhong L, Deng J, Peng J, Dan H, Zeng X, Li TW, Chen Q. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of mucosa. Nature Publishing Group. 2020; 12 (1):1-5.
31. Aljerian K, BaHammam AS. COVID-19: Lessons in laboratory medicine, pathology, and autopsy. Ann Thorac Med. 2020, 15:138-145.
32. Tai W, He L, Zhang X, Pu J, Voronin D, et al. Characterization of the receptor-binding domain (RBD) of 2019 novel coronavirus: implication for development of RBD protein as viral attachment inhibitor and vaccine. Nature: Cellular & Molecular Immunology. 2020: 1-8 Downloaded from https://www.nature.com/articles/s41423-020-0400-4.pdf, on 22 June 2020
33. Hoffman M, Weber HK, Schroeder S, Kruger N, Herrler T, et al. SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor. Cell Press. 2020; 181: 1-10.
34. Setiawan F, Puspitasari H, Sunariani J, Yudianto A. Molecular Review COVID-19 From The Pathogenesis and Transimission Aspect. Jurnal Kesehatan Lingkungan. 2020; 12(1).
35. Lau SKP, Chan JFW. Coronaviruses: emerging and re-emerging pathogens in humans and animals. Virology Journal. 2015; 12: 1-3.
36. Fu Y, Cheng Y, Wu Y. Understanding SARS-CoV-2 Mediated Inflammatory Responses: From Mechanisms to Potential Therapeutic Tools. Virology Sinica. 2020: 1-6.
37. Liu J, Li S, Liu J, Liang B, Wang X, et al. Longitudinal characteristics of lymphocyte responses and cytokine profiles in the peripheral blood of SARS-CoV 2 infected patients. 2020: 1-35.
38. Sun Q, Qiu H, Huang M, Yang Y. Lower mortality of COVID-19 by early recognition and intervention: experience from Jiangsu Province. Ann Intensive Care. 2020; Vol. 10:1-4.
39. Gardezi SAH, Ikram A. Application of Biosafety Principles in Laboratory Analysis of Clinical Samples from Patients with COVID-19. J Pak Med Assoc. 2020; 70(5):1-4.
40. Bruin YB, Lequarre AS, McCourt J, Clevestig P, Pigazzani F, Jeddi MZ, et al. Initial impacts of global risk mitigation measures taken during the combatting of the COVID-19 pandemic. Safety Science. 2020; 128:1-8.
41. Chen CC, Chi CY. Biosafety in the Preparation and Processing of Cytology Specimens With Potential Coronavirus (COVID-19) Infection: Perspectives From Taiwan. Cancer Cytopathology. 2020:309-316.
42. Tripathi M, Kumar S. Epidemiology, Treatment and Microbiological Surveillance of SARS-CoV-2. Ann Resc & Rev in Biol. 2020; 35(5); 114-121.
43. Kricka LJ, Poleikov S, Park JY, Fortina P, Bernerdini S, Satchkov D, et al. Artificial Intelligence-powered search tools and resources in the fight against COVID-19. eJIFCC. 2020; 31(2):106-116
44. Nguyen TT. Artificial Intelligence in the Battle against Coronavirus (COVID-19): A Survey and Future Research Directions. Preprints. 2020: 1-13.
45. Malone B, Simovski B, Moline C, Cheng J, Gheorghe M, Fontenelle H, et al. Artificial intelligence predicts the immunogenic landscape of SARS-CoV-2: toward universal blueprints for vaccine designs. 2020: 1-35.
46. Naude W. Artificial Intelligence vs COVID-19: limitations, constratins, and pitfalls. AI & Society. 2020: 1-5.
47. McCall B. COVID-19 and artificial intelligence; protecting health-care workers and curbing the spread. Lancet. 2020; 395:e30-e31.
48. Zein A. Pendeteksian Virus Corona Dalam Gambar X-Ray Menggunakan Algoritma Artificial Intelligence dengan Deep Learning Python. J Tekn Infor ESIT. 2020; XV(01):19-23
49. Vaishya R, Javaid M, Khan IH, Hallem A. Artificial Intelligence (AI) applications for COVID-19 pandemic. Diabet & Metabol Synd: Clin Resc & Rev. 2020; 14:337-339.