REVIEW ARTICLE

New Normal to Achieve High Threshold Herd Immunity by (Ro and Pc) Post Pandemic COVID-19

Fery Setiawan[1], Ahmad Yudianto[2], Jenny Sunariani[3], Latief Mooduto[4]

[1] Forensic Study Program of Postgraduate School, Universitas Airlangga, Surabaya, Indonesia
[2] Forensic and Medicolegal Department of the Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia
[3] Oral Biology Department of the Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia
[4] Dentistry Department of the Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia

ABSTRACT

World, especially Indonesia, is experiencing pandemic virus infection called Corona Virus Disease-19 (COVID-19) or Severe Acute Respiratory Syndrome Corona Virus-2 (SARS CoV-2). COVID-19 was firstly outbreak in Wuhan City on December 31 2019, having major receptors on Angiotensin Converting Enzyme-2 (ACE-2), especially located on lungs. One of its transmissions due to droplet and bioaerosol transmission,its attachment by the Spike 1 (S1) protein, and the invasion process by Spike 2 (S2). Invasion process stimulates host immunity resulting in excessive cytokines-chemokines production (cytokine storm) that has negative effect on the lungs, Acute Respiraatory Disease Syndrome (ARDS), and death. The New Normal phase is a new habit living with COVID-19 must be applied by community so that it reaches the treshold (Ro and Pc) on Herd Immunity and life postCOVID-19. There is a simple model that describes the components involved in Herd Immunity, namely: susceptible people exposed and recovered from COVID-19.

Keywords: COVID-19, Droplet-Aerosolized Droplet, Herd Immunity, New Normal, SARS-CoV 2

Corresponding Author:
Jenny Sunariani, PhD
Email: jenny-s@fkg.unair.ac.id
Tel: (+62) 315030255

INTRODUCTION

New Year's Eve 2020, that was celebrated on December 31, 2019, might be a New Year's Eve that would not be forgotten by all residents living in the city of Wuhan, Wubei, in Republic of China. A new pandemic has started, which is novel Corona Virus-19 (COVID-19) that causes pneumonia cases that have never been found in other viral diseases (1-3). Identification was carried out based on analysis conducted at laboratories and found that corona virus genome consists of 30,000 base pairs which are translated into corona virus protein after infecting host cells. The difference between Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV), Middle East Respiratory Syndrome Coronavirus (MERS-CoV), and Severe Acute Respiratory Syndrome Respiratory Disease Coronavirus 2 (SARS-CoV 2) is their transmission ability. SARS-CoV 2 transmission ability is higher than SARS-CoV and MERS-CoV because of its S protein genetic recombination in ACE-2 binding region, thereby increasing its transmission ability. The similarity between the three types of viruses is all three viruses are β-corona virus that causes pneumonia, Acute Lung Injury (ALI), Acute Respiratory Distress Syndrome (ARDS), and might lead to death (4-6).

Based on phylogenetic tree analysis of the virus in Figure 1, COVID-19 is a mutation form of both SARS-CoV and MERS CoV viruses. SARS-CoV 2 is a family of coronaviruses and is similar to two types of disease that became pandemic in 2003 and 2013 (7). SARS-CoV 2 is a member of Corona virus family, which is a group of RNA viruses (β coronavirus) with diameters between 60-140 nm and spike size ranging from 9 to 12 nm (8). Corona virus is easily mutated and is divided into several types: α, β, γ, and δ Co-V. COVID-19 infection belongs to zoonotic infection transmitted from intermediate animals, which are bats (Horseshoe Bat species Rhinolopus sinicus) and pangolins. Pangolins become a concern because they are illegally traded as a food source and a source of traditional medicine in China (9-12).

The purpose of making this review is to emphasize the importance of doing health protocol in pandemic COVID-19, since it can be transmitted by droplet, aerosol, and splatter transmission. Both droplets and aerosolized droplets released by patients through sneezing coughing, and exhaling have different maximum speeds and distances. Droplets and aerosolized droplets during sneezing might be ejected as far as 6 meters with speed 50 m / s in 0.12 seconds, during coughing might be ejected up to 2 meters with speed 10 m / s in 0.2 seconds, whereas during exhaling might be ejected up to 1 meter with speed 1 m / s in 1 second. Droplet transmission occurs in a very short distance (less than 2 meters or about 1.5 meters) and this is the basic concept of social distancing and wearing face mask based on the fact that droplets can be ejected as far as 1.5 meters when someone is walking or running. Dentistry procedure also produce lots of droplets through plaque cleaning process, the use of handpiece that producing aerosols (Aerosol Generating Procedures / AGPs), also can trigger the cross-infection from patien to dentist, dentist to patien, and from patient to other patient when they are in dentist's waiting room or practice room. The third health protocol is regularly washing hands with soap or hand sanitizer is to prevent self inoculation from our hands after touching materials that is to clean, ensure, and prevent self inoculation from hands after touching materials in public materials. Public materials can be splashed by droplet transmission so that it can enter to the oral, nose, or conjunctival mucosa in the eye and might reach the upper respiratory tract. This is supported Tissue Culture Infectious Dose-50 (TCID-50). TCID-50 theory summarizes that COVID-19 can still be in materials (plastics for 72 hours, aluminium for 48 hours, copper and carboard for 4-8 hours, and aerosol for 1.1-1.2 hours. (10, 13-16).

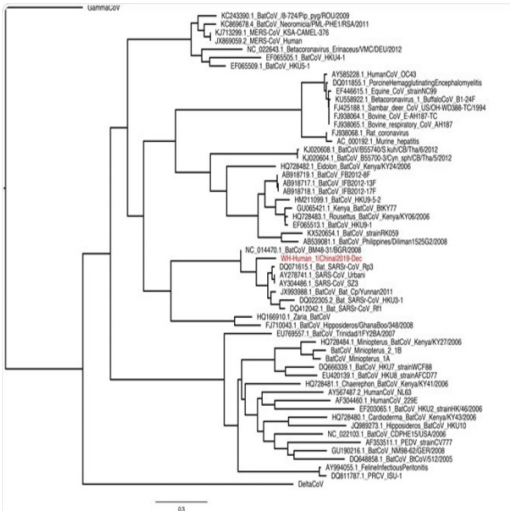

Figure 1 : Analysis of SARS-CoV 2 phylogenetic trees with SARS-CoV 1 and MERS-CoV.
Based on phylogenetic tree analysis between SARS-CoV, SARS-CoV 2, and MERS-CoV, similarity between SARS-CoV and SARS-CoV 2 was 88% and MER-CoV-with SARS-CoV was 50%. The three types of viruses come from the same tree, Bat-Coronavirus.

LITERATURE

Concept of New Normal era in new pandemic era on COVID-19

World Health Organization (WHO) and Deutsche Bank Research stated that COVID-19 pandemic will create a new era (New Normal), in this era people will coexist with COVID-19 until the discovery of anti-COVID-19 vaccine. COVID-19 affects all aspects of life, both health, financial, education, and many more. In this new era, people will begin to get used to new habits: wearing masks for every activity outside the home, not touching facial areas when doing activities outside the home, implementing social distancing / physical distancing policies, avoiding crowds and crowded places (Large-scale social restrictions), improving personal and environmental hygiene after outdoor activities or when returning home, and minimalize travel (working from home). In health policy world, New Normal era is started by using Personal Protective Equipment (PPE) and face shield (face shield) for health workers (9,14,17).

Concept of Herd Immunity as a community during COVID-19 pandemic

Basic concept of herd immunity is through acquired immune systems at an individual level that can be obtained through exposure to passive infection or through active infection (immunization) with vaccines. Correlation between COVID-19, new normal era, herd immunity, and post COVID-19 era is shown in Figure 2. Herd immunity is used to illustrate the comparison of immunity between individuals in a population, the threshold value of individual immunity that causes a decrease of disease incidence, and an immunity pattern that protects the population against a new infection (17-20).

COVID-19 vaccine is still being developed, therefore the basic concept of Herd Immunity is obtained through individual innate immune system. In the simplest model, several terms are related and

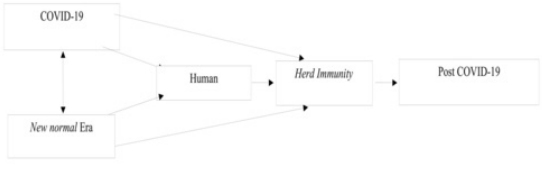

Figure 2. Schematic drawing among COVID-19, New Normal era, Herd Immunity, and Post COVID-19 life.[18,19,20]

Figure 2 : Schematic drawing among COVID-19, New Normal era, Herd Immunity, and Post COVID-19 life.
This model describes the correlation between COVID-19 and New Normal Era that is interconnected with one another which initiate Post COVID-19 life and Herd Immunity in a group.

used to determine Herd Immunity limits. The first term is Ro (basic reproductive number) which is the average number of secondary infections initiated by a single individual in a susceptible population. Re is the average number of secondary infections initiated by a single individual above infection period in a partially immune population. Ro and Re values due to COVID-19 pathogen are 4 and 3, respectively. Ro value of 4 means that each individual infected with COVID-19 pathogen gives an average Ro value of 4. Interpretation of Ro value is as followed: Ro less than 1 (Ro <1), Ro equals to 1 (Ro = 1), and Ro more than 1 (Ro> 1). Ro value <1 means that infection will disappear over time and chance for transmission is very small or absent. Ro = 1 means that infection might be endemic and persist in certain populations, while Ro > 1 means high level of epidemic occurrences and chance for transmission to others is high and outbreak number will continue to grow. Ro value is used to determine Pc value which is a critical value of the proportion of population that must be given immunization to achieve elimination process. Pc value is calculated using this equation: Pc = 1 - 1 / Ro which links the disease transmission process and critical proportion of population, where a greater value of pathogen transmission process means a greater proportion of population that needs to be vaccinated (22,23).

DISCUSSION

The correlation between New Normal and Herd Immunity in pandemic COVID-19

New Normal Era is a new era due to COVID-19 pandemic which affected almost all sectors of life, creating new habits that were not or rarely implemented, because in this era humans lived side by side with COVID-19. New normal era principle is to try to restore all sectors of life affected by COVID-19 pandemic while reducing number of COVID-19 infections. In New Normal era, humans must take several new habits: wearing masks when outdoor, wash their hands oftenly with either hand washing soap or hand sanitizers, implementing health protocol by social distancing / physical distancing because one of COVID-19 mode of transmission is through droplets from sick people or corpses to their surrounding environment. One of important things to remember during New Normal era is to maintain hygiene process in drinking water sources, because COVID-19 might be transmitted from one person to another through feces and water sources that are polluted by feces (24,25). This new era is expected to improve a group's immune system and break the chain of COVID-19 transmission, therefore immune system will improve and furthermore reduce COVID-19 incidence. Correlation between COVID-19 and Herd Immunity is that the human immune system consists of two types: innate immune system and acquired immune system. Currently, studies conducted on Herd Immunity focus on immune system.

Herd Immunity is related to infectious pathogens exposure to community groups, separating individuals into two groups: susceptible group and immune group, where immune group is expected to protect susceptible group from exposure. Herd Immunity concept also stated that vulnerable individuals will experience exposure, resulting in a Susceptible-Infectious-Recovery (SIR) process. Herd Immunity threshold depends on Ro, Re, and Pc. Ro value for COVID-19 is 4, therefore based on that value, Pc value must reach at least 75% to protect vulnerable groups to reach Herd Immunity.

Life post COVID-19

As mentioned in previous section, COVID-19 affected all aspects of human life, starting from health, social, community, immunology, forensics, financial, and other aspects as well. After Herd Immunity is achieved and New Normal era habits are implemented, human life will then depend on electric power sources and gadgets. Both types of sources will experience a rapid upward trend compared to conventional habits. It is possible that there are no more crowd events in large numbers, and financial transaction will use more electronic transactions compared to conventional transactions. Transportation service policies and public places will be reduced by about 50% from pre-COVID-19 era which is a consequence of New Normal trend, especially in transportations using vehicles for a rather long period of time (minimum of 10 hours) and using air conditioner (AC). This kind of transportations might worsen and accelerate the transmission process since airborne or droplet transmission patterns because there is a direct interaction between passengers and drivers for a long time, so therefore these public transportations must apply the terms of health protocol, such as: doing physical distancing, wearing face masks, washing hand frequently, and having good ventilation (13,26). Life will start again from the beginning, by entering the stage of life alongside corona's presence where all sectors continue to run as usual but are still followed by strict health protocol adoption (27).

CONCLUSION

New Normal Phase will enter the stage of coexistence with corona virus by maintaining all forms of life and social aspects but followed by strict health protocols. Final consequence of New Normal phase is Herd Immunity and post COVID-19 life era, therfore there might be no more crowds in crowded places, public transports and public places will be reduced by 50% from pre-COVID-19 era, and life depends on virtual (online) and electricity needs.

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