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LITERATURE REVIEW Open Access

SPECIAL ISSUE

LITERATURE REVIEW: HEALTHY HOME AS THE NEW NORMAL FOR COVID-19 PREVENTION

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Abstract

Introduction: *The SARS-CoV-2 virus has 2 pathways of spread which are direct (through droplets) and indirect (through the surface of objects affected by droplets or through air). Therefore, social distancing by staying in home is one of the key to prevent the spread of Covid19. However, the transmission of SARS-CoV-2 is increasingly common in family level. The risk of family members getting infected is higher because they begin to move outside the house during new normal. Accordingly, a good home environment is needed to improve its residents' health. This study aims to determine the benefits of implementing healthy home as the new normal in preventing the spread of Covid19 at family level.* ***Discussion:*** *This study was a literature review using literature research as the data source. The literature used were in the form of research journals and articles on Covid19 and healthy home. The data used were research studies conducted from January 2016 to June 2020. There was 9 articles, about benefit healthy home on SARS-CoV-2 transmission, that selected in this study. Healthy home was the idea of homes that have fulfilled the health standards with adequate sanitation. Healthy home was purposively built to make the residents feel comfortable and stay healthy at all times. The components of healthy home were: good ventilation; natural lighting of the house; occupancy density; residents' behavior; and waste management.* ***Conclusion:*** *The application of healthy home principle had many benefits for its residents and was closely related to Covid19 prevention.*

INTRODUCTION

Covid19 has caused public unrest for the community since it was announced by WHO to be a public health emergency on 30 January 2020. China became the first country to be affected by Covid19. The disease later spread throughout the world and became a threat to the global community (1). Over time, on March 11, 2020 Covid19 has been set as a global pandemic (2). As of June 14, 2020 Covid19 had infected a total of 7.690.708 people and caused a total of 427.630 deaths in 216 countries or areas (3).

Covid19 is an acute respiratory disease caused by the SARS-CoV-2 virus. People with 60 years of age have a higher risk of death. In addition, people who have congenital diseases such as chronic breathing, heart disease and diabetes also have higher risks of death. The spread of this disease are possible through direct contact such as droplets or indirect contact such as through inanimate objects and aerosols (4). WHO have established social distancing regulations or commonly called physical distancing, with the aim of suppressing and controlling the rate of spread of this disease (5). Most countries set lockdown policies and implement social distance restrictions in response to WHO recommendations. Countries that have set a lockdown require its citizens to remain at home to prevent contact with others. Countries that do not set a lockdown also require their citizens to be at home as much as possible and do work from home to reduce mass gathering that can become a mean of virus transmission. In addition, other preventive measures recommended by WHO is hand hygiene by washing hands with soap and running water. However, lately the spread of Covid19 is increasing in number especially through family members of the infected. There are still many family members who have the risk of transmitting Covid19 to other family members. In China, 2.135 Covid19 patients are children under 18 years old and at least 1% of the population tested positive for Covid19 are children under 10 years old. Some children are infected through family members or their playmates. Children have a significant risk of transmission, because they are less symptomatic compared to adults (6).

After large-scale social restrictions (PSBB) regulation in Indonesia and tight lockdowns in most countries, World Health Organization (WHO) recommends a new normal protocols to deal with the pandemic. The implementation of new normal is accompanied by strict health protocols as a new habituation. Communities are required to start new habits and patterns of life in order to adapt in a new normal condition. Changes are needed in all aspects of human life related to this disease, not only lifestyle-wise but also in terms of environmental aspects of living things.

In epidemiological triangle, environment becomes one of the disease's outbreak factors. Sanitation is an important part of environment that determines health status. Not only sanitation, but individual hygiene behavior is also one of the environmental factors that influence the spread of disease. Individual hygiene behavior and supporting sanitary facilities must be pursued as a preventative measure (7). Good sanitary conditions must be accompanied by good personal hygiene to create a balance. Therefore, the principle of healthy home can be an alternative to prevent transmission of Covid19 to the family and maintain family immunity. The application of healthy home is expected to improve health standards for the residents. Good residents' health standards can increase productivity because the residents feel physically and mentally safe. Good body health can foster good body immunity and reduce the possibility of various diseases (8).

This study aims to determine the benefits of implementing healthy home to prevent the spread of Covid19 at family level. This study is a literature review using literature research as data source. The literature used were research articles about healthy home and Covid19. This study also uses supporting data that related to healthy home and infectious diseases published from January 2016 to June 2020.

DISCUSSION

Covid19 is a serious disease with many questions that are yet to solve. Researches on Covid19 have been carried out to get the right treatment for this disease. Various diseases with similar transmission to Covid19 have been widely studied. In addition to that, researches on healthy homes have been carried out to prove its effect on the spread of disease in the home.

This study uses literature review method using Covid19 and healthy homes related research articles. Search for articles using the keywords "Healthy home" and "Covid19" articles are obtained from several electronic database sources, namely Google Scholar, Pubmed, and Science Direct.

The articles used are articles published from January 2016 to June 2020 with predefined inclusion criteria. After selecting with inclusion criteria, 9 articles

Table 1. Summary of articles included in Healthy Home as New Normal to Prevent COVID-19's Literature Review

Authors	Title	Method	Population/ Sample	Result	Conclusion
Juan Wang, Guoqlang Du	Covid19 may transmit through aerosol	Case Report	One case in Mongolia on 3 feb 2020. Four case in Jinyintan Hospital, Wuhan	If Covid19 cannot spread through aerosols, it is difficult to explain case such as in Mongolia and Jipyintan Hospital Wuhan. Aerosol distribution can reach 1-2 m.	Covid19 may transit through aerosol directly, but it needs to be further verified by experiments. If aerosol can spred Covid19, prevention and control will be much more difficult.
Martha Ardiara	Peran Vitamin D dalam Pencegahan Infuenza dan Covid19	Systematic Review	-	Vitamin D's role in Covid19 is to increase the production of pro-inflammatory cytokines, protein C reactive, treatment of pneumonia and respiratory failure.	Most observational studies provide positive result related to the effect of vitamin D and Covid19. However, based on RCT studies, there is not studies yet that can proved that Vitamin D has effect on Covid19
Yueling Ma, Yadong Zhao, Jiangtao Liu, Xiaotao He, Bo Wang, Shihua Fu, Jun Yan, Jingping Niu, Ji Zhou, Bin Lou	Effects of temperature variation and humidity on the death of Covid19 in Wuhan, China	Cohort	Data daily death in COVID19 and meteorological from 20 January 2020 - 9 February 2020 in Wuhan China	Temperature and humidity has similliar pattern with Covid19 rate. The mortality counts of Covid19 were negatively associated with relative humidity but strongly positive for temperature. In addition, the curves associated with relative humidity and absolute humidity presented similar linear trends, which indicated that the higher level humidity might cause decrease in the Covid19.	Temperature' variations has positive correlation with Covid19. Humidity has negative correlation with Covid19's mortality
Iwan Stia Budi, Yustini Ardillah, Indah Purnama Sari, Dwi Septiawati	Analisis Faktor Risiko Kejadian Penyakit TB bagi Masyarakat Daerah Kumuh Kota Palembang	Cross Sectional	Patient in Palembang' Health Center	Statistically relationship between the gender, TB history of family members, access to information, lighting, humidity, roof conditions, , house floor, with incidence of pulmonary tuberculosis ($p<0.05$) and variable bivariate oddupancy density it found that occupancy density is the most dominant variable	Home characteristics has a role in the spread of Tuberculosis. Occupancy density is a dominant factor in the occurrence of the disease.
Puti Sari H, Khadijah Azhar, Julianty Pradoono, Noor Edi. W. Sukoco	Association of Handwashing Behavior, Drinking Water Management and Healthy Homes with the Occurrence of Hepatitis In Indonesia	Cohort	Riset kesehatan dasar tahun 2013	Hand washing and water management are the most dominant behavior associated with hepatitis was hand washing. Other factors who has significant correlation with hepatitis are healthy homes, economic status and living in rural area.	Handwashing and water management are the essential factors of hepatitis
Alan D. Workman, D. Bradley Welling, Bob S, Carter, William T. Curry, Eric H. Holbrook, Stacey T. Gray, George A. Scangas, Benjamin S. Bleier	Endonasal instrumentation and erosolization risk in the area of Covid19 simulation, literature review, and proposed mitigation atrategies	Simulation	Fluorescein solution, blue-light filter, and digital image processing	Among the outpatient conditions, a simulated sneeze event generated maximal aerosol distribution at 30 cm, extending to 66 cm. Both an intact surgical mask and a modified VENT mask (which enables endoscopy) eliminated all detectable aerosol spread. Among the surgi-cal conditions, cold instrumentation and microdebrider use did not generate detectable aerosols. Conversely, use of a high-speed drill produced significant aerosol contamination in all conditions tested.	Aerosolization presents a risk to the endonasal skull base surgeon. In the outpatient set- ting, use of a barrier significantly reduces aerosol spread.
Roengrudee Patanavanich, Stanton A. Glantz	Smoking Is Associated With Covid19 Progression: A Meta-analysis	Systematic Review	19 peer-reviewed papers with a total of 11,590 Covid19 patients	That study identified, 2,133 (18.4%) with severe disease and 731 (6.3%) with a history of smoking. A total of 218 patients with a history of smoking (29.8%) experienced disease progression, compared with 17.6% of non-smoking patients. The meta-analysis showed a significant association between smoking and progression of Covid19 (OR 1.91, 95% confidence interval [CI] 1.42-2.59, $p = 0.001$). Limitations in the 19 papers suggest that the actual risk of smoking may be higher.	Higher odds of Covid19 progression happened on smokers.
Marcos Paulo Gomes Mol, Sergio Caldas	Can the human coronavirus epidemic also spread through solid waste?	Systematic Review	-	Infected waste from COVID 19 patient, that being treated at home, can pose risks to workers and the environment	The spread of the coronavirus may be increased by inadequate waste management, highlighting poor handling conditions associated with inappropriate use of personal protective equipment and other

Authors	Title	Method	Population/ Sample	Result	Conclusion
Leo Heller, Cesar R. Mota, Dirceu B, Greco	Covid19 faecal-oral transmission: are we asking the right questions?	Hypothesis and framework	-	The most possible path in oral fecal transmission is when feaces enter through sanitation's sewer and enter fresh water. After that water is consumed by people and causes respiratory infection and ingestion. Another possible route is through contact with surfaces that are cleaned using that water or surfaces that contaminated through vectors that has correlation with feaces or that water.	Due the current lack of evidence on the relevance of the fecal oral transmission of SARS-CoV-2, paper need for more in depth research. If hypothesis is confirmed, interventions related to provision safe water and adequate should be immediately added to the current strategies for Covid19

about benefit healthy home on SARS-CoV-2 transmission are selected. Selected articles regarding Covid19 are written by Indonesian and foreign authors.

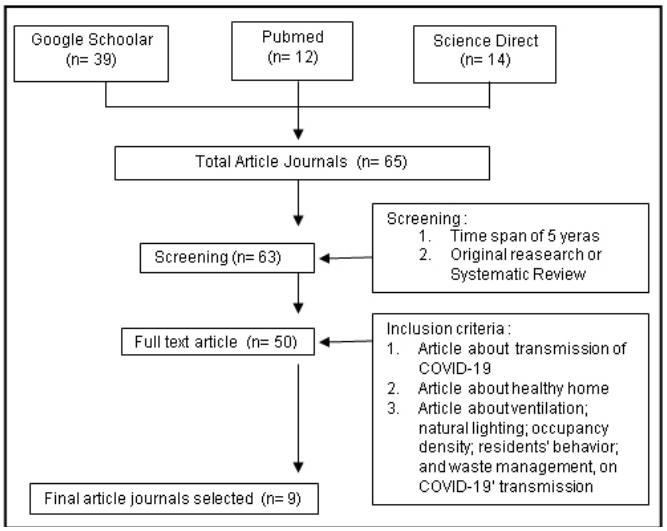

Figure 1. Journals Selection Process

After several months of dealing with Covid19, the world began to adjust to the existence of this disease. Adjustment to the new normal concept is made as one step to restore community activities and keep the economy running. However, people should not abandon their new habits of dealing with the pandemic. The health protocol applied during the pandemic has become a new normal as a part of community life. People must deal with new normal adaptation even though activities outside remain to be avoided as much as possible. Community disobedience is feared to be a boomerang for the community itself. The threat of the second wave of Covid19 is still endangering various countries that implements new normal. Therefore, there needs to be various preparations from both the government and the community before setting a new normal policy (8).

Home is one of the primary needs of human as a place to survive. Ideally, home is supposed to protect its residents from various dangers including germs and diseases. Therefore, home should be the safest and most comfortable place for human. Especially in a pandemic like today, most of the community's time is spent at home. The community is expected to be safer from the SARS-CoV-2 virus by being indoors. The house must be sterile and healthy from the virus germs, lest the house become a source of disease development. Healthy home is a house that has fulfilled the health standards, so that the residents feel comfortable and stay healthy. Healthy home shows that the house has good sanitation. Houses that have good sanitation can reduce health risks, for example Upper Respiratory Infections (URIs) and Pneumonia (9). There are several conditions that must be met to create healthy home.

There are 10 requirements for healthy home according to the State Minister for Public Housing Indonesia, i.e. building materials; structure; components; spatial planning; location; lighting; air quality; ventilation; and occupancy density (10). Other studies also stated almost the same thing related to the requirements of healthy home which consists of 3 things, they are, the house parts; sanitation facilities; and residents' behavior. The results of the assessment of those category are used as a measurement to consider a house to be healthy or not (11). From these two studies, requirements that are selected as the main components of healthy home are home ventilation, natural lighting, occupancy density, residents' behavior and waste management. House ventilation and occupancy density are the aspects of the house that are useful for maintaining air quality. Meanwhile, the residents' behavior is one of the key components to maintain a healthy home. The residents who are aware of the importance of health will keep the house clean so that there are no disease vector or germs that can transmit disease. The residents' awareness of the importance of hygiene can prevent the transmission of various types of diseases, one of which is Covid19.

Implementing principle of healthy home has been proven in several previous studies to be one of disease's spreading factors (7,12). Diseases that are often studied are related to sanitation and airborne spread. Covid19 is a disease with multiple spreading sources, which is, through direct and indirect contact. This disease can spread through droplets and there is a possibility that it can spread through aerosol air that has been damped with droplets. Therefore, several healthy home variables related to Covid19 prevention were examined in this study, including:

Ventilation

Ventilation is used as an air pathway in and out of the house. In addition, ventilation also serves to bring natural light from the sun into the house (9). Sunlight that enters the house serves to maintain temperature and humidity. Cross ventilation is a good form of ventilation for indoor air exchange. Substitution of air in the room is useful for removing contaminated air in the house due to germs, so that it can be replaced with new, fresh air into the house. The air that enters the house contains more oxygen and is expected to neutralize germs that are inside the house. Therefore, air is commonly referred to as natural disinfectant (13).

House ventilation must be regularly opened to provide indoor air exchange. Houses that rarely open the ventilation are considered unhealthy (7). Closed ventilation can inhibit air exchange. If there is no air exchange, it will facilitate the spread of viruses and bacteria. This is because the main function of ventilation is to remove virus germs inside the house and maintaining the humidity of the house (14). Therefore, the more ventilation in the house the better it is for the house. In addition, ventilation can help to supply oxygen in the house and maintain a healthy home condition. Ventilation in the form of Air Conditioner (AC) must be regularly cleaned because the AC is associated with the spread of germs in the room. The virus can stick to the airflow and spread throughout the room (15).

The virus spread via droplets can reach 1-2 m away from the point of distribution. A study has led to several speculations that refer to the possible spread of Covid19 through aerosols (16). If Covid19 can survive in aerosols, the spread will be wider. If with droplets the virus can spread within 1-2 meters distance, with aerosol viruses can spread even further than that. Aerosols can spread and carried by the wind. This will be a problem if there is not enough good ventilation in the house. Adequate ventilation will replace contaminated air due to disease contamination with new and fresher air. Good ventilation in the right placement will result in better air exchange in the house. However, there are many shortcomings in this study because it only uses a few instances of Covid19 positive events and involves few existing literature studies. Method(s) used in determining the selection of cases and literature are not mentioned. The explanation that is also presented is still in the form of a brief explanation of the possibilities that might occur. This study still needs further research to support and prove the arguments. There are still numbers of debates going on since there are many unknown possibilities about the disease (17). Even so, we should be aware of these possibilities and make references to take preventative measures.

Natural Lighting

Natural lighting is the light that comes from sunlight. Sunlight is needed in the house because it functions as a germ killer. A healthy home needs natural lighting from the sun at least 60-120 lux (10). Sunlight contains vitamin D that is needed by the body. There have been several studies that examine the benefits of Vitamin D in healing and preventing Covid19 cases. The role of vitamin D in a study of Covid19 is as an enhancer in the production of pro-inflammatory cytokines and reactive C protein (18). This can help in the treatment of pneumonia and respiratory failure that is often experienced by Covid19 patients. Research that underlined this theory has proven that vitamin D has an influence in boosting the immune system and reducing the risk of infection. However, this research has only been carried out by the literature study method, no one has been able to prove the truth. In addition to these studies, there are other studies regarding the possibility of Vitamin D reducing the risk of influenza and Covid19 with the literature study method. The results of the study stated that Vitamin D can reduce the risk of respiratory tract infections (19). However, no one has been able to prove directly about the impact of vitamin D on Covid19 disease from these two studies. Although no one has been able to prove the argument, the Government of Indonesia has given advice to the public to get direct sunlight every day. In the health protocol written by the Ministry of Health of the Republic of Indonesia, it is recommended for every Indonesian citizen to maximize the air circulation and sunlight to enter the house (20).

Lighting also serves to prevent the room in the house from being stuffy and humid (14). There are several studies conducted to prove the effect of humidity and temperature on events related to respiratory infections or Covid19 events. In a study conducted in China, it was concluded that temperature variations affect the case of Covid19 mortality, while humidity does not affect Covid19 deaths (21). However, it is stated that there are many shortcomings in the study because of many other factors that might influence Covid19 mortality.

The air and humidity in the house must remain in a stable condition. The room humidity recommended by the Ministry of Health of the Republic of Indonesia is 40-70% (9). This is proven in a study on Covid19 cases in the Province of China that shows high temperatures

can inhibit the spread of Covid19 (22). In summer and spring weather in the Province of China, the progression of positive cases slowed. In addition, based on analysis of disease and meteorological event data, when humidity in the area is high, viruses in droplets have a higher survival ability and will die at moderate humidity. The research still needs further research because it did not include other variables that are also the cause of Covid19. The results of the study are the same as those of research who review all cases in provinces of China. The results of the study mentioned that temperature and humidity affect the transmission of the spread of Covid19 (23). However, this research still has many shortcomings because the data used are not homogeneous and there are many other possible factors of Covid19. Similar studies conducted on positive cases of Covid19 in Jakarta proves that average temperature affects Covid19 cases in Jakarta (24). However, this study also has many shortcomings because many other causative factors are not examined.

Further research on the influence of humidity and temperature is still needed because there are still many studies that claim there is no relationship between humidity and temperature on Covid19. Although many have proven that humidity and temperature do not have a significant relationship on Covid19, theoretically, temperature and humidity still have an influence on positive confirmed cases and patients with symptoms. This is because the nature of viruses, especially the SARS-CoV-2 virus, is more stable in cold and dry air environments. In addition, cold and dry air condition can reduce host's immunity (21). However, it has been emphasized in several studies that summer and rain will not necessarily eliminate the SARS-CoV-2 virus, yet there is a possibility that it may decrease the number of cases based on statistical calculations (25).

There are some studies that disagree with some previous studies. One study conducted in China showed no relationship between temperature and humidity with the spread of Covid19 (26). The results of the study are supported by other studies with a systematic review method. It is found that there is no significant relationship between temperature and humidity with Covid19 cases (27). However, further research is still needed because the variables studied are limited and may still require many additional variables. The validity of the study cannot be determined yet because in-depth research has not been conducted by involving many other factors.

The benefits of humidity and temperature as the factors causing Covid19 are still debatable based on several research results. In addition, although vitamin D is considered to provide benefits for healing Covid19, this has also not been fully proven because there are no experimental studies conducted directly. However, the benefits of adequate sunlight should be considered as one of the steps to prevent Covid19, based on the many benefits that will be obtained by residents.

Occupancy Density

Dense housing can make the house unhealthy because the oxygen supply will decrease. In addition, dense housing can facilitate transmission of the disease. Houses that have high occupancy density will have an effect on poor air quality in the house. A house is said to have a high density of occupancy if a room with room area for one person is occupied by two or more people. The size of the occupancy density depends on the quality of the building and facilities of the house. Simple house building minimum area is 8 m^2/person (28).

Dense housing facilitates the spread of disease, making the air become unhealthier because air that should be used for one person must be shared with others. Therefore, a dense house will facilitate the spread of disease, especially through the air. This fact is supported with a case study of tuberculosis (28). Tuberculosis is a disease that spreads through a patient's droplet. At the conclusion of the study, it is mentioned that occupancy density is the dominant factor in the incidence of tuberculosis spreading at the family level. This research proves that homes with high densities have a high risk of transmitting each other. The risk of transmission is high due to spread with droplets which can spread the disease from a distance of 1-2 m. Houses with high occupancy densities make it more difficult to keep the distance between residents. The possibility of physical contact made will be higher because of the narrowness of the room.

The main spread path of Covid19 is through droplets and direct contact (5). The SARS-CoV-2 virus can spread through direct contact from droplets and indirectly through objects affected by droplets or airborne (27). Currently, the quarantine at home is the choice to avoid Covid19. The quarantine movement called social distancing was created to reduce the interaction between people and the form of a crowd (29). At home, the community must implement social distancing and avoid contact with family unless they have established a health protocol. Although there is no clear research that proves the benefits of social distancing and independent isolation at home, if they tested positive of Covid19, this strategy is expected to prevent transmission (30). Many cases have been reported as a result of transmission to families who live in one house. The case of Covid19 in China showed that children can be a source of transmission of Covid19

at home. Cases in children show less symptoms but can still be transmitted to other family members. This becomes more dangerous because the child does not show any symptoms when they are sick. With a high level of occupancy, the possibility of transmission from adults to children and vice versa will be even greater. In addition, in the new normal period children will return to activities outside. When a child is outside the possibility of getting transmitted is inevitable. Children who are positive for Covid19 but do not have symptoms can continue to play like normal children. Transmission can occur when children gather to play. Infected children will bring the virus home and can be a source of transmission for the entire family. The case in China in February 2020 showed that there were 2.135 pediatric patients aged <18 years and of the total affected population there were 1% of children who tested positive for Covid19 with age <10 years (6). The amount of children who are infected can be larger if the child spreads the virus to the family.

The large number of cases of children in China can be taken as a lesson so that it doesn't happen in other countries. Children can be infected from adults who are still working outside because during the pandemic children spend most of their time at home with family. When the new normal begin, the child can also be infected by playmates. This will be a big problem when children who are infected by Covid19 show no symptoms. This condition causes a decrease in adult alertness so that they are not aware of contracting the virus. The spread is easier for other family members if the house has a high level of occupancy. Lack of fresh air in the house, making the opportunity of the family to breath air that has been contaminated with the virus is greater. Moreover, physical contact between families in high level of occupancy is likely to be more frequent and there will be more infected cases because of the easy distribution.

Personal Hygiene Behavior

Residents' behavior is very closely related to the cleanliness of the house. A healthy home must have healthy residents. Poor hygiene behavior can easily cause disease to enter the body. In a study conducted on hepatitis sufferers, it is stated that 97% of people in Indonesia do not wash their hands with soap (7). The study also proves that hand washing and healthy home have a relationship with the spread of the hepatitis A virus in Indonesia. Hepatitis spreads because of poor hygiene behavior. The habit of not washing hands causes the virus to easily enter the body through digestion or other body parts. Hand washing behavior can eliminate viruses in the hands. In addition, the behavior of washing cutlery with cleaning fluid each time after using them also affects the spread of the virus (7). Cutlery that is not washed with a cleaning fluid will leave viruses and germs. Viruses and germs of this disease will enter the body when we use these unsterile eating utensils.

The Covid19 protocol published by the CDC mentions several ways to protect yourself and others from Covid19 (31). The first protocol is to be diligent in washing your hands with soap or with a hand sanitizer containing at least 60% alcohol. Washing hands with soap and hand sanitizer is more effective on killing germs than using only running water. Washing hands with soap and hand sanitizer can kill more than 50% of disease germs in human hands (32). The higher the alcohol content in the hand sanitizer the higher the effectiveness on removing germs. One way to minimize the risk of this disease is to apply personal hygiene. One application of personal hygiene is by washing hands in accordance with health protocols with running water and soap or hand sanitizer for at least 20 seconds before entering the house.

The second protocol that must be applied by the community is to prevent contact with others as much as possible, especially with the sick people. The community is expected to stay at home as much as possible and keep their distance from others. The third protocol is to use masks outside and use at home when sick. The use of barriers to the nose and mouth can reduce the spread of aerosols. The use of personal protective equipment is important especially for patients and health workers (33). Health workers in hospitals most often see patients with symptoms of cough, fever, dizziness and headaches (34). Health workers who treat them have a high risk of contracting the virus, not only from patients but also from various contaminated medical equipment. Therefore, health workers must use extra protective equipment. The masks worn must be N95 masks, and use other equipment such as goggles, disposable gloves and hazmat (35). This is useful so that medical personnel can avoid the risk of contracting and transmitting it to other people, including families at home.

The next protocol is to apply the ethics of coughing and sneezing. When coughing or sneezing, people should cover their mouth and nose with tissue, or if there is no tissue, it should be covered using elbows and then cleaned with antiseptic (31). The last protocol is cleaning and sterilizing all surfaces of objects that are used and touched every day. This is done to prevent indirect transmission. A droplet containing SARS-CoV-2 may stick to everything we normally touch such as cellphones, wallets, money and even desks at home.

Therefore, all parts of the house especially those most frequently touched must be diligently cleaned using disinfectants to prevent transmission of Covid19.

In addition, smoking increases the risk of contracting Covid19. Smoking is often associated with respiratory problems and cancer. This is in line with the Covid19 disease, because the main route of entry for the SARS-CoV-2 virus is through breathing (36). In a study using a meta-analysis, it is stated that there is a significant association between smoking and Covid19. Smokers have a higher risk of experiencing complications from Covid19 (37). People with Covid19 who are smokers have higher angiotensin coverting ezyme 2 (ACE 2) than non-smokers (36). This affects heart function and excretion of the vascular endothelium. These risk factors not only affect active smokers but also other family members who become passive smokers. In addition, there is an additional risk for secondhand smoking, namely the smoking behavior of repeatedly using your hand to hold the cigarette to your mouth. This can be a factor in the transmission of Covid19 by mouth (36).

Waste Management

Waste is the result of human activity in the form of discarded materials. Waste can be in the form of gas, liquid or solid objects. Household waste is generally in the form of solid waste or commonly called garbage and liquid waste resulting from various human activities. During the pandemic, the use of personal protective equipment in the form of masks, gloves and other protective equipment is piled up. This has become a new problem for the wider community because until now, it has not been handled properly (38). Poor handling of infectious waste at the household level can be a new source of transmission. Infectious waste must be very well considered even though the amount is small. The local community and government must work together to solve this problem. The community must learn to separate infectious waste from ordinary domestic waste. Furthermore, the government must prepare temporary waste storage and infectious waste management locations for the community.

In a study, it was mentioned that Covid19 patients treated at home have the potential to cause infectious waste (39). This infectious waste is disposed of in the same place as domestic waste. This can endanger the garbage transport officer and the waste manager. This risk is even greater because of the insufficient use of protective equipment that supports the officer (39). Indirect transmission is most likely to occur to garbage transport workers. In addition, transmission may occur if it turns out that waste management is carried out by family members themselves. This can have a dual impact, which is self-transmission and pollution to the environment. Infectious waste must be treated specifically and with strict procedures. Infectious waste that is not managed properly can be a source of new transmission to the environment and surrounding communities.

Liquid waste is important to consider during this pandemic. This is related to the number of patients without symptoms who are advised to do outpatient care at home. Although this disease has not been proven to be able to spread through other means besides droplets, the possibility of spread through other body parts still needs to be watched out for. In an article that illustrates the possibility of transmission through fecal oral (40). The most possible path in fecal-oral transmission is when feces enter water sources directly such as rivers. It is possible that feces with positive Covid19 contain the SARS-CoV-2 virus and can spread to drainage water which then flows to the river (41). River water is used by the community as a source for consumption and can cause infection through ingestion. The second possibility is when feces are not managed properly and then seized by disease vector such as flies. The fly then flies to the surface of the object and is touched by humans, causing indirect transmission to humans. This study still needs further research because no experiment has been carried out before. However, the results of the study are worth considering. If Covid19 can spread through fecal-oral, this will be very dangerous for people who live in environments with poor sanitation. There are still many areas in Indonesia where its residents do not have toilet at home. This needs special attention from the government, especially during this pandemic.

The implementation of healthy home has not been proven yet to be one of the preventive ways for the spread of Covid19. More research needs to be done on the benefits of applying the principle of healthy home during the COVID 19 pandemic. However, some researches related to healthy home can provide an overview of the health benefits that would be obtained if applied by the community. The benefits of healthy home are closely related to the prevention and treatment of the SARS-CoV-2 virus. By applying the principle of healthy home, there will certainly be a distinct advantage for the residents of the house. The application of healthy home can be one of the first steps in welcoming the new normal. Healthy home trends as new normal protocol can build positive community's perspective towards the importance of home sanitation and personal hygiene. Home sanitation and personal hygiene which were initially considered as odd things will become a habit when it has become the new normal.

CONCLUSION

The benefits of healthy home are closely related to the prevention and treatment of the SARS-CoV-2 virus. Implementing healthy home standards can be one of the options to adapt in new normal protocols for Covid19 prevention. Healthy home has a variety of benefits for the health of its residents and the surrounding environment. People who live in a healthy home have greater opportunities to be healthy and lesser risk to contract communicable diseases. Covid19 is a contagious disease that spreads through direct (droplet) and indirect contact (aerosols and the surface of objects affected by droplets). Implementation of healthy home standards has good impact to prevent the occupants of the house from Covid19 distribution when the requirements are met. The requirements for a healthy home are good ventilation, adequate natural lighting, the house is not densely inhabited, good residents' behavior by implementing health protocols and good waste management. This study needs further in-depth research for its lack of practical evidence regarding healthy home and Covid19. In addition, there are several other possible factors for the spread of Covid19 which are not examined in this study. This research is expected to be an illustration of the benefits of implementing healthy home standards as one of the prevention of Covid19 specially at family level.

REFERENCES

1. World Health Organization. Infection Prevention and Control guidance for Long-Term Care Facilities in the context of Covid19. Interim Guidance of World Health Organization. Geneva: World Health Organization; 2020. https://apps.who.int/iris/handle/10665/331508
2. World Health Organization. Preparedness, Prevention and Control of Coronavirus Disease (Covid19) for Refugees and Migrants in Non-camp Settings. Geneva: World Health Organization; 2020. https://apps.who.int/iris/handle/10665/331777
3. World Health Organization. WHO Covid19 Dashboard. Geneva: World Healh Organization; 2020. https://covid19.who.int/
4. Dangi RR, George M. A Review on Theories and Models of Disease Causation for Covid19. *Preprints J SSRN Electron*. 2020;1-15 https://doi.org/10.2139/ssrn.3584080
5. World Health Organization. Water, Sanitation, Hygiene and Waste Management for the Covid19 Virus: interim Guidance April 2020. Geneva: World Health Organitation; 2020. https://apps.who.int/iris/handle/10665/331846
6. Yu Y, Chen P. Coronavirus Disease 2019 (Covid19) in Neonates and Children From China: A Review. *Front Pediatr.* 2020;8(5):1–12. https://doi.org/10.2139/ssrn.3584080
7. Sari HP, Azhar K, Pradono J, Sukoco NEW. Hubungan Perilaku Cuci Tangan, Pengelolaan Air Minum dan Rumah Sehat dengan Kejadian Hepatitis di Indonesia. *J Ekol Kesehatan*. 2018;17(1):41–51. https://doi.org/10.22435/jek.17.1.139.41-51
8. Zeegen EN, Yates AJ, Jevsevar DS. After the Covid19 Pandemic: Returning to Normalcy or Returning to a New Normal?. *J Arthroplasty*. 2020;35(1):37-41. https://doi.org/10.1016/j.arth.2020.04.040
9. Sulistyo AS, Tamtomo D, Mudigdo A. The Association Between Maternal Education, Family Income, House Sanitation, and the Incidence of Acute Respiratory Tract Infection in Children Under Five. *J Epidemiol Public Heal.* 2016;1(3):195–202. https://doi.org/10.26911/jepublichealth.2016.01.03.06
10. Sabaruddin A, Hartini, Hermawan Y. Modul Rumah Sehat. Kementerian Pekerjaan Umum: Bandung; 2018. p. 1–2. http://puskim.pu.go.id
11. Chamid AA. Penerapan Metode Topsis Untuk Menentukan Prioritas Kondisi Rumah. *Simetris J Tek Mesin, Elektro dan Ilmu Komput*. 2016;7(2):537-544. https://doi.org/10.24176/simet.v7i2.765
12. Sumertha IGG, Adiputra N, Pujaastawa IBG. Hubungan Kualitas Sanitasi Rumah Dengan Kejadian Penyakit Infeksi Saluran Pernapasan Akut (Ispa) Di Wilayah Kerja Puskesmas IV Denpasar Selatan Kota Denpasar. *Journal Environ Sci*. 2015;9(2):41-45. https://doi.org/10.24843/ejes.2015.v09.i02.p07
13. Akash A, Yar UB. House-Hold Safety Recommendations in Covid19 Pandemic. *Eur Journal Med Sci*. 2020;2(1):1–14. https://doi.org/10.46405/ejms.v2i2.55
14. Mariana D, Hairuddin MC. Kepadatan Hunian, Ventilasi Dan Pencahayaan Terhadap Kejadian Tb Paru Di Wilayah Kerja Puskesmas Binanga Kabupaten Mamuju Sulawesi Barat. *Journal Kesehat Manarang*. 2018;3(2):75-80. https://doi.org/10.33490/jkm.v3i2.40
15. Lu J, Gu J, Li K, Xu C, Su W, Lai Z, et al. Covid19 Outbreak Associated with Air Conditioning in Restaurant, Guangzhou, China, 2020. *Emerg Infect Dis*. 2020;26(7):3–5. https://doi.org/10.3201/eid2607.200764
16. Wang J, Du G. Covid19 May Transmit Through Aerosol. *J Ir Med Sci*. 2020;1(5):5–6. https://doi.org/10.1007/s11845-020-02218-2
17. Asadi S, Bouvier N, Wexler AS, Ristenpart WD. The Coronavirus Pandemic And Aerosols: Does Covid19 Transmit Via Expiratory Particles?. *Journal Aerosol Sci Technol.* 2020;54(6):635–638. https://doi.org/10.1080/02786826.2020.1749229
18. Ardiara M. Peran Vitamin D dalam Pencegahan Influenza dan Covid19. *J Chem Inf Model*. 2020;53(9):79–85. https://doi.org/10.1080/02786826.2020.1749229
19. Grant WB, Lahore H, McDonnell SL, Baggerly CA, French CB, Aliano JL, et al. Evidence that Vitamin D Supplementation Could Reduce Risk Of Influenza And Covid19 Infections And Deaths. *Journal Nutrients*. 2020;12(4):1–19. https://doi.org/10.3390/nu12040988

20. Ministry of Health Republic Indonesia. Decree of Minister of Health Republic Indonesia No. HK.01.07/ MENKES/328/2020 about Prevention Guide and Manage Corona Virus Diasese 2019 (Covid19) in Workplace and Indusrty. Jakarta: Ministry of Health Republic Indonesia; 2020.
21. Ma Y, Zhao Y, Liu J, He X, Wang B, Fu S, et al. Effects of Temperature Variation and Humidity on the Death of Covid19 in Wuhan, China. *J Sci Total Environ*. 2020;724(138226):1-7. https://doi.org/10.1016/j.scitotenv.2020.138226
22. Oliveiros B, Cramelo L, Ferreira N, Caramelo L. Role of Temperature and Humidity in the Modulation of the Doubling Time of Covid19 Cases. *J Xiandai Huagong*. 2020;40(5):186–189. https://doi.org/10.1016/j.scitotenv.2020.138226
23. Qi H, Xiao S, Shi R, Ward MP, Chen Y, Tu W, et al. Covid19 Transmission in Mainland China is Associated with Temperature and Humidity: A Time-Series Analysis. *J Sci Total Environ*. 2020;728(138778):1-7. https://doi.org/10.1016/j.scitotenv.2020.138778
24. Tosepu R, Gunawan J, Effendy DS, Ahmad LOAI, Lestari H, Bahar H, et al. Correlation between Weather and Covid19 Pandemic in Jakarta, Indonesia. *J Sci Total Environment*. 2020;725(138436):1-4. https://doi.org/10.1016/j.scitotenv.2020.138436
25. Wang J, Tang K, Feng K, Lv W. High Temperature and High Humidity Reduce the Transmission of Covid19. *Preprints J SSRN Electron*. 2020;1-33. https://doi.org/10.2139/ssrn.3551767
26. Chen B, Liang H, Yuan X, Hu Y, Xu M, Zhao Y, et al. Roles of Meteorological Conditions in Covid19 Transmission on a Worldwide Scale. *Preprints medRxiv*. 2020;1-19. https://doi.org/10.1101/2020.03.16.20037168v1
27. Lotfi M, Hamblin MR, Rezaei N. Covid19: Trasmission, Prevention, and Potential Therapeutic Opportunities. *J Clin Iva Chim Acta*. 2020;508(1):254–266. https://doi.org/10.1016/j.cca.2020.05.04
28. Budi IS, Ardillah Y, Sari IP, Septiawati D. Analisis Faktor Risiko Kejadian Penyakit Tuberculosis Bagi Masyarakat Daerah Kumuh Kota Palembang. *J Kesehatan Lingkungan Indonesia*. 2018;17(2):87-94. https://doi.org/10.14710/jkli.17.2.87-94
29. Wilder-Smith A, Freedman DO. Isolation, Quarantine, Social Distancing and Community Containment: Pivotal Role for Old-Style Public Health Measures in the Novel Coronavirus (2019-nCoV) outbreak. *J Travel Med*. 2020;27(2):1–4. https://doi.org/10.1093/jtm/taaa020
30. Fong MW, Gao H, Wong JY, Xiao J, Shiu EYC, Ryu S, et al. Nonpharmaceutical Measures for Pandemic Influenza in Nonhealthcare Settings-Social Distancing Measures. *J Emerg Infect Dis*. 2020;26(5):976–984. https://doi.org/10.3201/eid2605.190995
31. Center for Disaese Control and Prevention. How to Protect Yourself and Your Family. USA: Center for Disaese Control and Prevention; 2020. https://www.cdc.gov/coronavirus/2019-ncov/communication/print-resources.html
32. Riza A, Oes A, Rusdy H, Nisah K. Comparison of the Effectivity of Handrubbing and Handwashing on the Number of Bacterial Colonization on Clinical Students at the Departement of Oral and Maxillofacial Surgery, Faculty of Destistry, Universitas Sumatera Utara March-May 2018. *J Dentomaxillofacial Sci.* 2019;4(1):45–48. https://doi.org/10.15562/jdmfs.v
33. Workman AD, Welling DB, Carter BS, Curry WT, Holbrook EH, Gray ST, et al. Endonasal Instrumentation and Aerosolization Risk in the Era of Covid19: Simulation, Literature Review, and Proposed Mitigation Strategies. *J Int Forum Allergy Rhinol.* 2020;10(7):798-805. https://doi.org/10.1002/alr.22577
34. Tian S, Hu N, Lou J, Chen K, Kang X, Xiang Z, et al. Characteristic on Covdi-19 Infection in Beijing. *J Annals of Thoracic Surgery*. 2020;110(2):697–700. https://doi.org/10.1016/j.athoracsur.2020.04.003
35. Krajewska J, Krajewski W, Zub K, Zatoński T. Covid19 in Otolaryngologist Practice: A Review of Current Knowledge. *J Eur Arch Oto-Rhino-Laryngology*. 2020;277(7):1885–1897. https://doi.org/10.1007/s00405-020-05968-y
36. Berlin I, Thomas D, Le Faou AL, Cornuz J. Covid19 and Smoking. *J Nicotine Tobacco Research*. 2020;22(9):1–3. https://doi.org/10.1093/ntr/ntaa059
37. Patanavanich R, Glantz SA. Smoking is Associated with Covid19 Progression: A Meta-Analysis. *J Nicotine Tobacco Research*. 2020;22(9):1653-1656. https://doi.org/10.1093/ntr/ntaa082
38. Nzediegwu C, Chang SX. Improper Solid Waste Management Increases Potential For Covid19 Spread In Developing Countries. *J Resour Conserv Recycl.* 2020;161(1):19–21. https://doi.org/10.1016/j.resconrec.2020.104947
39. Mol MPG, Caldas S. Can the Human Coronavirus Epidemic Also Spread Through Solid Waste?. *J Waste Manag Res*. 2020;38(5):485–486. https://doi.org/10.1177/0734242X20918312
40. Heller L, Mota CR, Greco DB. Covid19 Faecal-Oral Transmission: Are we asking the Right Questions?. *J Sci Total Environ*. 2020;729(318919):1-4. https://doi.org/10.1016/j.scitotenv.2020.138919
41. Randazzo W, Truchado P, Cuevas-Ferrando E, Simon P, Allende A, Sanchez G. SARS-CoV-2 RNA in Wastewater Anticipated Covid19 Occurrence un a Low Prevalence area. *J Water Res*. 2020;181(1): 1-7. https://doi.org/10.1016/j.watres.2020.115942