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LIFE IN PANDEMIC ERA:

CHALLENGES AND OPPORTUNITIES TOWARD ENVIRONMENTAL SUSTAINABILITY

An Approach to Pandemic Era – Proper Handling of The Used Face Mask

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Abstract

World Health Organization (WHO) declared a SARS-CoV-2 pandemic since it has affected the whole region. The Malaysian government has made wearing face masks mandatory to prevent SARS-CoV-2 infections. This article aims to disseminate the benefits of using face masks during the COVID-19 crisis and enhancing awareness on the proper disposal of face masks towards the sustainability of the environment. Daily usage of face masks has the potential to cause harm to the environment due to the excessive production of waste. Therefore, to tackle the issues that arise from the mismanagement of the face mask disposal, material such as a short video "Proper Handling of The Use Face Mask" is needed to educate the community.

Keywords: COVID-19, waste management, face mask, disposal, environment

INTRODUCTION

On January 24, 2020, Malaysia reported the first covid-19 case, persuading the government to declare a movement control order (MCO) throughout the nation. The government had imposed a lockdown on all states in order to halt the virus from spreading. All Malaysians had to remain at home with minimal outdoor activity. A mitigating action is taken to curb the spread of disease, such as adherence to the established SOPs, developing the MySejahtera application to facilitate the government in the management and containment of the COVID-19 epidemic, and restrictions of business hours. The Malaysian government also made face masks in crowded places mandatory. Anyone who contravenes is compounded under Prevention and Control of Infectious Diseases Act 1988, a sum of money not exceeding RM 1,000. Furthermore, the new norm needs to be embraced by all Malaysians for the COVID-19 disease elimination. About 87 percent of Malaysian respondents stated that they were wearing face masks when in public places during the COVID-19 outbreak.

Epidemiological Evidence and Ecological Studies

Coronavirus is transmitted through aerosol and airborne droplets. The COVID-19 spread from one person through respiratory droplets and contact routes based on a current finding. The number of masks used has increased significantly since February 2020 (Statista, 2021). A mask is made up of three layers of non-woven fabric. It features a waterproof outer layer, which efficiently resists liquids such as salivary drops. The middle layer is a filter that prevents particles or pathogens from penetrating both directions. These three layers adequately prevent the penetration of pathogens and particles in both directions for the user and the surrounding people (Chua et al., 2020) including subsided the particles and protect the user (Prather et al., 2020).

Following the outbreak of SARS-CoV-2, many countries have issued regulations regarding the use of face masks. Research by Leung et al., (2020) indicates no coronavirus was found in the samples taken from a person with surgical masks, compared to those without masks. A study conducted in the United States (Rader et al., 2021) and China showed that using a community mask can reduce COVID-19 transmission (Wang et al., 2020). Furthermore, surgical masks provide efficient filtering and reduced microbial content expelled by any person who coughs. For the Influenza virus, surgical masks and respirators (N95) were commonly used to prevent the spread of the disease from infected patients (Johnson et al., 2009). These pieces of equipment were also effective in protecting healthcare workers from infection (Radonovich et al., 2019). A comparison was made between tea-cloth masks, surgical masks, and Filtering Face Piece2 Mask respirators. Evidence showed that tea-cloth masks provided lower protection; less than 2 times compared to surgical masks and 50 times less protection than FFP2 respirators (van der Sande et al., 2008). A surgical mask essentially reduced the transmission of COVID-19 and presented minor clinical manifestations on lab rats (Chan et al., 2020). However, it is important to remember that these masks can only protect against COVID-19 infection for a limited time. The CDC has issued a general recommendation for the use of cloth masks, which can effectively block particles and droplets up to 50-70% in various areas. However,

respirators performed extra protection than surgical masks and reusable cotton masks, as proven by the metanalysis of betacoronavirus.

The study conducted in Beijing, China, revealed that masks reduced the secondary transmission of COVID-19 by 79%. The remaining study revealed that wearing a mask when going out was highly protective, with a risk reduction of 70% for those who always wore one, but it did not look at the impact of masks on transmission from the wearer. Research by Leffler et al. (2020) in multiple regression techniques using a range of policy interventions by) geographic and socio-demographic factors to infer the connection between mask use and SARS-CoV-2 transmission. They discovered that regions without comprehensive mask usage had a transmission rate that was 7.5 times higher, a finding that was comparable to those of smaller-scale studies (Kenyon, 2020). A study conducted by researchers showed that the implementation of mask mandates or a comprehensive mask use lowered the daily growth rate in US states by 2.0 percentage points, prevented 230000 to 500000 COVID-19 cases by May 2020 (Lyu & Wehby, 2020).

Epidemiological studies have evaluated the effectiveness of wearing a mask to reduce SARS-CoV-2 transmission. During an epidemic in a hair salon in Springfield, Missouri, 67 clients who were tested were not affected by the two symptomatic stylists who attended 139 clients (Hendrix et al., 2020). All employees and clients who visited the salon were obliged to wear a mask when entering the facility. During the USS Theodore Roosevelt's COVID-19 outbreak, persons who wore masks had a 70% lower chance of being infected with SARS-CoV-2 infection (Payne et al., 2020). Furthermore, cases involving contacts and household clusters that were masked have shown significant decreases. An expanding number of ecological studies determined universal obligatory mask-wearing regulations linked to reducing infection rate and fatalities. A study conducted by researchers found that the effects of mask mandates on the growth of infections in 15 US states and the District of Columbia were slowed significantly before and after implementation of mask mandates (Lyu & Wehby, 2020).

Personal protective equipment (PPE), social isolation, travel limitations, and lockdown is currently used to reduce the extent of coronavirus transmission (Rubio-Romero et al., 2020; Sun et al., 2020). A rapid accumulation of potentially infectious waste in the solid waste stream globally was due to the increased number of personal protective equipment such as face masks, gloves, goggles, gowns used among the healthcare workers and in the general populations during the COVID-19 pandemic (Singh et al., 2020, p. 8500). To control the viral re-emergence and protecting the environment, disposal of wastes must be proper (Ma et al., 2020), as well as the achievement of the Sustainable Development Goals, especially SDG3, SDG6, SDG8, SDG12, and SDG13 (Ma et al., 2020). Any substance containing suspicious pathogens in a suitable concentration leads to disease in possible hosts and causes life-threatening diseases determined as infectious waste. Inappropriate management of solid waste, for instance, can exacerbate coronavirus transmission, especially in underdeveloped nations.

According to a recent study by Kampf et al., (2020) human coronaviruses can survive on hard surfaces (metal, glass, or plastic) for up to nine days. Insufficient solid waste dumpsters are the primary source of infectious waste contamination in the general community; the challenges are more significant in developed countries, despite the fact that certain Asian countries are still not emphasizing the appropriate procedures of waste management. Most of the countries in the developed regions (Cambodia, the Philippines, Thailand, India, Malaysia, Indonesia, Bangladesh, Vietnam, and Palestine) are known to have unsatisfactory solid waste management facilities (Ferronato & Torretta, 2019). Due to this, infectious waste is one of the many factors that will inevitably cause environmental concern if not properly handled.

On July 31, 2020, the COVID-19 pandemic database revealed the projected number of face masks worn in 49 Asian nations. Subsequently, 2,228,170,832 face masks used in Asia. The total daily face masks used in Malaysia was 7,049,901 pieces (Sangkham, 2020). According to Akber Abbasi et al. (2020), almost all face mask wastes add plastic or macroplastic pollution to the environment. It also demonstrates that the current ongoing pandemic increases environmental pollution and affects human and animal health. Therefore, while encounter the mask demand, continual solutions need to reduce environmental impacts. Polypropylene is the most commonly used material for a 3-ply surgical mask, but other fabrics such as polystyrene, polycarbonate, polyethylene, and polyester can also be used. These materials are known to cause microplastics and particulate pollution in the environment (Schnurr et al., 2018). Improper use of face masks causes a severe environmental crisis in solid waste and microplastic contamination in coastal and freshwater environments. These polymeric materials enter the water bodies in various ways, such as leaching, flooding, and by the wind. Thus, disposable face masks appeared in the environment first as disposal in landfills and dumpsites or littering at public spaces, then into the freshwater oceans as a new emerging source of microplastic fibres.

Environmental Impacts of Used Face Mask

The toxicity of plastic has been observed in various scientific papers (Wu et al., 2019; Galloway et al., 2017; Rist et al., 2018). Some of the main pollutants include phthalates, organotin, and nonylphenol. The degradation of plastic polymers can result in the release of toxic chemicals into the environment. Due to the presence of microplastics in aquatic life, many fishes were threatened as well as higher concerns about food safety and the availability of food. In addition, plastics and particles cause pollution to shore environments and, as a result, will decrease the aesthetics and recreational value of coastal areas. In addition, plastics and particles cause pollution to shore environments and, as a result, will decrease the aesthetics and recreational value of coastal areas. The existence of plastic and plastic particles will lead to drought and global warming. Climate change is expected to worsen the environment's deteriorating conditions Hence, jeopardized human social and mental stability. Plastic and particles tend to multiply microorganisms, therefore spread via the food chain and/or trigger direct access. The greater issue, from this vantage point, is microplastics establishing a niche for microbes and producing biofilms. The microbial components of an environment might differ from those of naturally occurring free-living microorganism populations in the adjacent aquatic environment. The increasing amount of microplastics in the world endangers the ecological function of the environment and disturbs human health.

According to a specified study, improper disposal of face masks, plastic and plastic particles have been identified as a major cause of pollution. In addition, face mask production also contributes to carbon dioxide missions, which can contribute to global warming. The production of N95 and surgical masks uses propylene, small aluminium strips, and polypropylene, which emit significant amounts of Carbon dioxide (CO2) (Liebsch, 2020). The N95 mask produces 50 g CO2-eq., exclusive of transportation. The surgery mask has 59 g CO2 for each person, and the major distribution is in the process of transportation.

Medical examiner’s face masks are handled cautiously as hazardous waste in hospitals. The amount of 124,000 tonnes of plastic waste, 66,000 tonnes of contaminated waste, including 57,000 tonnes of packaging, were produced, conceding that each individual used one disposable mask daily for a year (Lisa Allison et al.,). Waste generated by the general public currently does not have a dedicated stream, and most of it ends up on the streets. The COVID-19 pandemic has drawn a substantial challenge in managing urban sturdy waste and dangerous pharmaceutical waste. In addition, discarded hospital masks and mixed waste were sent to the incinerator and landfill. Due to this technique of managing those waste, plastics contained in the mask caused harm to the environment. A study also revealed that the disposal of 10 tons of waste of personal protective equipment, such as face masks, led to a

global warming potential of 2.76 kilograms CO2 when transported up to 10 kilometres (Kumar et al., 2020). Moreover, it affects the unhealthy environment for a long period of time if this condition persists

The plastic particles can enter an animal's stomach when mistakenly eaten and cause death due to starvation. Ingestion of plastic also caused developmental problems in children and was highlighted by the study of Kleme et al. (2020). Besides entanglement, the death of waterfowl and other aquatic animals may occur. Due to abiotic factors such as erosion, photodegradation, and aquatic immersion, the microplastics in the mask become fragmented. This leads to their bioaccumulating toxins in the food web.

CONCLUSION

The surgical face mask is a potential source of microplastic contaminants in the littering and water systems. To tackle the issues that arise from the mismanagement of the face mask disposal, material such as a short video is needed to educate the community. According to Ahmad et al. (2015), videos outperform pamphlets as an Environmental Education tool. The finding was an expected outcome as the video contained more enjoyable elements than the pamphlet, such as a voice-over or narration and background music. However, some respondents preferred viewing the pamphlet because of the extended video duration (approximately 14 minutes). Therefore, the short video contents we proposed will be approximately 3-5 minutes in duration, with less narration and more sequences with just visuals and background music. It allows viewers to better process and remembers the information being disseminated. According to (Vandormael et al., 2020), the media that combines entertainment and education (E-E) will increase behavioural intent toward health-related practices. During this COVID-19 pandemic, E-E media will cover millions of people without having any physical interaction. Based on the issues highlighted, a short video is designed to disseminate information on the environmental impacts of improper disposal of used face masks and educate the community about the proper way of disposing of used face masks.

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