

SF Community Medicine and Health

Five Key Issues for Assessment of Mass Masking Effects in COVID-19

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Abstract

Covid-19 disease is currently recognized as the most important global crisis. Despite the lack of a definitive treatment for it, it may be possible to prevent its rapid spread by using personal protective equipment. Among of them, the face mask has been introduced more importantly than other ones. Complying with World Health Organization (WHO), the governments follow the mass masking policy. No researches have been comprehensively done about advantages and disadvantages of face mask in various conditions. In this article, we outline five key issues that should be considered in an assessment of the effects of mass masking policy.

Keywords: Mass masking; Face mask; Personal protective equipment; Covid-19; WHO

Introduction

The most important common concern in the world right now is to stop the spread of Covid-19 disease caused by the coronavirus in recent months. The coronavirus can survive on a wide range of porous and non-porous materials including metal, plastic, paper, wood, glass, woven and non-woven fabrics, including cotton, polyester, and disposable tissues [1,2]. Studies have shown that the coronavirus has almost survivability more than other viruses. It can also survive in environmental reservoirs such as water, on foods, and in sewage for extended periods. As a result, it can be transmitted from the environment to the general public and even healthcare providers. Once contaminated via the environment, hands can contaminate mucous membranes of the nose, eyes, or mouth, and lead to disease [3]. However some of scholars believed that coronavirus cannot be transmitted through normal surfaces. The virus spreads mainly from person to person, rather than *via* contaminated surfaces, according to the Centers for Disease Control and Prevention [4].

Among the common respiratory symptoms of COVID-19 are dry coughing, fever, dyspnea, musculoskeletal symptoms (myalgia, joint pain, and fatigue), gastrointestinal symptoms, and losing smell and taste sense [5,6].

The virus can also be transmitted from person to person through small droplets that come out of their mouth or nose and enter the environment in such a way that the infected person breathes or coughs, and other people become infected by inhaling the droplets or touching infected surfaces and then touching their mouths, noses, or eyes [3]. Therefore, to prevent the release of infection and control the consequences of the disease, it has been advised to optimum use personal protective equipment such as face masks and eye protection in public and specially hand hygiene facilities [7-9]. It seems reasonable that a face mask reduces virus transmission through preventing wearers from touching their mouths or noses with their hands or other potentially contaminated objects [10]. Hence, the World Health Organization considers the use of hand sanitizers and advises to use a medical face mask while waiting in different areas and during movements [7].

Thus in this paper, we review a specific issue in the health policy making should public use face mask to prevent getting infectious diseases such as Covid-19 or not? Any decision in this regard depends on five key points on wearing face mask against coronavirus: Prevention of virus spread, Decreased oxygenation, Contamination of face mask due to improper use, Placebo and nocebo effect, and Environmental issues. Decision making on the mass mask depends on costs-effectiveness analyzing the consequences of these five issues in a global or local environment.

Prevention of Virus Spread

Typically, medical face masks are made of three layers of dense cotton or similar materials.

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They capture large droplets that carry bacteria and viruses during exhalation. These droplets are usually the size of pollen grains or dust spots (from a few to about 100 micrometers). But in the case of small particles which are less than 2.5 micrometers, like air and toxic gases, medical face masks can't provide any protection [11,12]. Face masks (N95) evaluated by viral aerosol have a purification efficiency of more than 99% and protect against the transmission of viral aerosol disease. This test method can also be used to evaluate the effectiveness of filtration against viral aerosols of other face masks used to protect respiration [13].

As mentioned earlier, coronavirus can be transmitted to others through particles containing the virus at short intervals or through direct contact with the patient's secretions. Therefore, wearing a face mask properly is considered a protective barrier against this virus and it helps to prevent the spread of Covid-19 disease. Although masks can't prevent viral diseases, if a person is suspected of having the disease, they can significantly reduce the spread of contamination especially in public places [10].

Generally, the pandemic depends on the characteristics of the virus transmission, the effectiveness of the face mask, and the rate of mask use in the population. The use of face masks not only protects healthy individuals but also reduces the infection of symptomatic and asymptomatic carriers [14], thus reducing the number and effectiveness of virus transmission sources in the population.

Decreased Oxygenation

Anatomic dead space is defined by the total volume of the airways from the nose to the terminal bronchioles, where lung has about 150 ml on average. This space in respiratory system does not play role in gas exchange. Because this space can hold some of the exhaled air which is inhaled in next step. The volume enclosed between the internal surface of the mask and the wearer's facial surface is so called mechanical (or apparatus) dead space. The presence of a face mask increases the anatomic dead space to some extent, thus reducing the amount of oxygenation.

Additionally, it will be difficult to breathe, by face mask, when it is used for a long time on hot days. The face mask can increase resistance of major airway and thus reduce oxygen uptake. As a result decreased oxygen levels lead to hypoxic symptoms such as changes in respiration rate, heart rate, energy expenditure for respiration, and blood gas levels, including saturated oxygen [15,16]. Hypoxia is called a pervasive stimulus that affects many physiological processes that lead to cardiovascular and respiratory incompatibility. In mild cases, this can cause drowsiness and fatigue, and in severe cases (specific cases) it can cause irreversible complications in the internal organs of the body [17,18].

Contamination of Face Mask due to improper Use

People sometimes wear the same mask many times to save money; once clogged, masks are worse than useless [11]. A contaminated face mask can increase the risk of infection because touching face mask to adjust it can contaminate face mask or hands. The face mask may become damp while breathing, so any virus that gets on it, can stay infectious for a longer time. Removing the face mask incorrectly can also contaminate it or the hands.

According to the CDC, "Individuals should be careful not to touch their eyes, nose, and mouth when removing their face covering" [19].

The WHO seconds this point, too. "Remove it from behind (do not touch the front of face mask)" [20]. The reasoning is this: if there are virus particles trapped on the outside of the face mask, they'll get on hands when touching it (another reason to make sure to wash hands after disposing of face masks).

Placebo and Nocebo Effect

Placebo effect is beneficial effect(s) produced by an inefficient drug or treatment as a result of patient's belief in that drug or treatment. In other words, belief in a drug or treatment positively contributes to outcomes [21]. The use of medical technology and equipment can also have a placebo effect [22]. There are indications of how the effects of placebo may distort the implementation of a logical policy [22,23].

Based on the placebo effect, it can be said that healthy people use face masks with the idea of being safe against viral diseases. Subsequently, this thinking can, to some extent, increase immunity against the disease. Specific analyses of the occurrence of such an event can be provided. People with the equipment may have higher psychological confidence [24] and thus their stress will be reduced. Reduced stress, in turn, boosts the body's immune system and makes the body more resistant to disease [25]. The effect of stress reduction on increasing the strength of the immune system against some infectious viruses and diseases has also been reported [26]. Face mask use is also expected to affect behavior. Wearing a face mask can subconsciously increase awareness of the risk of infection and the importance of other preventive behaviors such as social distance, frequent hand washing, preventing physical contact, and preventing people from entering crowded public places [10].

There is also another effect called nocebo; the nocebo effect is a phenomenon that is opposite to the placebo effect, whereby the expectation of a negative outcome may lead to the worsening of a symptom [27]. There are different analyses of the nocebo effect. For example, mandatory mass masking for non-believers may not have an effect or it may have an adverse effect. Additionally, global or local shortage of masks may lead to so-called mass mask panic and subsequently confusion and chaos [28]. In turn, this mass panic can decrease the body's immune system against diseases.

Also, there are some important psychological effects which are not limited to neither placebo nor nocebo effect. For example, in some cases wearing face mask could even make the problem worse. They have the potential to lull people into a false sense of security, encouraging them to spend more time outside in dirty air [10,11].

Environmental Problems

When evaluating a product's environmental issues, the life cycle should also be considered, which includes the whole process of design, manufacture, and use. Currently, the most common and important product against coronavirus in the world is the face mask, which is available in almost all places, as everyone are trying to get at least a mask. However, all of them, from the simplest to the most advanced, are made of polymers. As a result, as the consumption of masks increases, the waste from them should not be disposed of but should be selectively collected and recycled so that they do not appear as plastic or even infectious waste. Plastics are important because they are needed for sustainable development and have properties that other materials do not. Therefore, they can be used responsibly [29]. Of course, the general public does not take the safe disposal of masks seriously. On the other hand, when wearing masks is to be

recommended to the general public, their use and disposal will be much higher than the normal hospital level, especially if they are used for a long time and in a global level. Use of non-renewable resources, the disposal, or recycling of materials causes many environmental problems [30]. This problem can, directly and indirectly, threaten the health of communities. Therefore, environmental damages should be considered while recommending the use of masks to the public.

The unprecedented use of disposable masks and medical gloves has added to the global burden of plastic waste. Failure to pay attention to the accumulation of infectious and domestic waste may lead to environmental pollution and the creation of the second wave of disease [31]. For example, on average, each person in the UK wears a disposable face mask for one hour a day, causing 66,000 tons of contaminated plastic waste from the face masks alone. Although there are systems in hospital settings for the safe disposal of disposable equipment such as face masks and gloves, including segregation and burning, there is no such segregated system available to the general public, and a policy that makes it mandatory to wear a face mask causes thousands of tons of waste. Contaminants are stored on the streets and in household waste [32]. The use of natural resources to produce face masks and disposing of this volume will lead to the depletion of natural resources and the increasing pollution of the living environment. From this point of view; reusable cloth masks are preferable to disposable surgical masks. They were used by surgeons successfully during operations before disposable masks were available [28].

Conclusion

Surely, a health system in each country should guide the people about proper place, proper time, and proper kind of the masks which must be used in the society. Our study indicates that policy making on mass masking during an epidemic or pandemic requires pay attention to all of these five points in a cost-effectiveness analysis: Prevention of virus spread, Decreased oxygenation, Contamination of face mask due to improper use, Placebo and nocebo effect, and Environmental issues. The consequence of these five issues guides a policy maker to decide whether it is necessary to advice public to wear masks or not.

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