



## To Mask or Not To Mask? A Review of Literature

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### Abstract

During the COVID-19 pandemic, face masks, such as surgical masks and cloth masks, were employed as a public and personal health control measure against the spread of the SARS-CoV-2 virus. Using masks is recommended for diseases transmitted through airborne droplets and respiration, but the recommendations vary based on the guidelines. Since the beginning of the outbreak, the World Health Organization (WHO) has repeatedly revised the recommendations on the general use of face masks. Until recently, the WHO recommended limiting the use of facemasks to symptomatic people and advised against off-standard solutions. Moreover, recommendations differ among and within countries; in general, the routine use of masks by the WHO, CDC, and European Centre for Disease Prevention and Control (ECDC) in the community is not recommended.

However, the use of face masks is recommended in crowded environments (such as public transportation), and for people at risk (the elderly, pregnant women, and those with underlying diseases). The World Health Organization recommends general measures to reduce the transmission of infection, including thorough hand washing, respiratory hygiene, and avoiding close contact with live or dead animals and sick individuals. It should be noted, however, that people who do not have respiratory symptoms do not need to wear a medical mask in the community, even if COVID-19 is prevalent in that area. It is also important for health authorities to provide clear guidelines for the production, use, sanitization, or reuse of face masks and consider their distribution as shortages allow. Clear and implementable guidelines can help increase compliance and bring communities closer to the goal of reducing and ultimately stopping the spread of COVID-19.

**Key Words:** CDC, ECDC, Face mask, Review, WHO.

\*Please cite this article as: Pouyanfar A, Ghazanfarpour M, Imannezhad Sh, Ahmadi R, Nosratabadi I, Khodabakhshi A. et al. To Mask or Not To Mask? A Review of Literature. Health Provid 2021; 1(1): 21-32. DOI: [10.22034/HP.2022.149029](https://doi.org/10.22034/HP.2022.149029)

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Received date: Jan. 11, 2022; Accepted date: Mar.22, 2022

## 1- INTRODUCTION

Knowledge about the transmission of the COVID-19 virus is increasing every day. COVID-19 is primarily a respiratory disease, and the range of infection with the virus can range from very mild, non-respiratory symptoms to acute respiratory illness, followed by limb dysfunction and death. In some infected people, no symptoms have been reported. Evidence suggests that the COVID-19 virus is transmitted primarily through respiratory droplets and airways. Droplet transmission occurs when a person is in close contact (within one m) with an infected person and exposure to potentially infectious respiratory droplets has occurred; for example, through coughing, sneezing, or very close personal contact, resulting in contamination of the body's entry points such as the mouth, nose, or conjunctiva (1-7). Transmission may also occur through contaminated objects in the immediate vicinity of the infected person (8, 9).

Thus, the transmission of the COVID-19 virus can occur directly from contact with an infected person or indirectly through contact with surfaces in the vicinity of and used by an infected person. Some published studies have indicated transmissions from asymptomatic individuals (10-15). Therefore, to prevent the spread of the virus, it is necessary for all people to wear masks when there is coronary heart disease in the community, especially indoors, such as on buses, subways, shops, as well as places where people other than family members are present. On the other hand, using a mask for a person who carries the disease or a healthy person has created challenges in societies; some people agree with using the mask, and some oppose doing so, and both groups have reasons for their claim.

This study aimed to review the research conducted in this field and valid scientific guidelines to meet this challenge.

## 2- MATERIALS AND METHODS

### 2-1. Data sources

Using a narrative review as a method allows an interdisciplinary approach to evidence synthesis, which can deepen understanding and provide interpretation. In this review study, a systemic search of electronic databases of Medline (via PubMed), SCOPUS, Web of Science, ProQuest, Cochrane Library, SID, Magiran, CIVILICA, and Google Scholar search engine was performed with no time limit up to December 2021, using the following keywords alone or in combination: "COVID-19", "Mask", "Face Mask", "Prevention", "Cons", "Pros", "Advantages", "Disadvantages", "Negatives", and "Positives". The search was performed independently and in duplication by two reviewers, and any disagreement between the reviews was resolved by the supervisor.

### 2-2. Study selection

The database search was done for suitable studies. Abstracts of the studies were screened for identification of eligible studies, full-text articles were obtained and assessed, and a final list of eligible studies was made. This process was done independently and in duplication by two reviewers, and any disagreement was resolved by a third reviewer. References were organized and managed using EndNote software (version X8).

## 3- RESULTS

Based on the results of articles, journals, and official guidelines of various countries, the use of masks is recommended for diseases transmitted through airborne droplets and respiration, but the recommendations vary based on the guidelines and areas. However, the regular use of the mask in the community is not recommended by the WHO, CDC, or ECDC. The main characteristics of the

selected studies are summarized in the following:

### 1. Evidence

Several randomized clinical trials have been conducted on the use of masks in the community and in medical centers using a wide range of interventions, including the use of masks or multiple interventions (such as the use of masks and washing hands), with varying results. Of a total of nine clinical trials that used masks in community settings, all but one study used masks for respiratory protection in the community. They found that the use of masks alone and masks in addition to washing hands may be contingent on early use and observance of infection in community settings (16-24). However, the overall evidence available to determine the effectiveness and efficiency of the mask alone is low to moderate due to mixed interventions.

The World Health Organization (WHO) advises the use of masks as part of a comprehensive package of prevention and control measures to limit the spread of SARS-CoV-2, the virus that causes COVID-19. A mask alone, even when it is used correctly, is not sufficient to provide protection or source control. Other infection prevention and control (IPC) measures include hand hygiene, a physical distance of at least one meter, and avoidance of touching one's face, respiratory etiquette, and adequate ventilation in indoor settings, testing, contact tracing, quarantine, and isolation. Together, these measures are critical to preventing human-to-human transmission of SARS-CoV-2. For any mask type, appropriate use, storage, and cleaning or disposal are essential to ensure their effectiveness as far as possible and to avoid an increased transmission risk (25, 26).

The WHO also issued a guideline, "Guidelines for the rational use of personal

protective equipment against COVID-19", on 27 February, 2020, stating that patients without respiratory symptoms do not need to use protective equipment when they are in triage units, counseling rooms, or waiting rooms or when they are in public places, such as shopping malls, bus stations, and subways (27). The CDC also recommends that masks be used in places of high transmission. It is also important to avoid crowded spaces and poorly ventilated indoor spaces if there is an increased risk of severe illness from COVID-19 and to stay at least six feet (1 foot= 0.304 m) away from other people if the individual is at high risk or not up-to-date on their vaccines (28).

Results of another study showed that the application of face masks in public is considered a temporary measure for several perceptible groups of people, not a substitute for established precautionary procedures. There is an urgent need to search for alternatives with higher efficacy than face masks. Face shields and social distancing may be better substitutes for face masks for some people due to reasons such as chronic obstructive pulmonary disease (COPD) acute and chronic respiratory diseases, outdoor exercise, old age, underlying medical conditions, and hypercapnia sensitivity. However, further clinical studies are required (29).

A review of the benefits and burdens of wearing face masks at school in the current COVID-19 pandemic in Germany showed that face masks could prevent the spread of the virus, particularly as the virus can spread from people with no symptoms. However, covering the lower half of the face reduces the ability to communicate, interpret, and mimic the expressions of those with whom people interact. Positive emotions are less recognizable, and negative emotions may be amplified (30).

A qualitative interview with 31 participants in the German-speaking region of Switzerland in April 2020 and with 25

of them again in October 2020 assessed the underlying values and considerations of individuals to wear face masks without face mask mandates during the COVID-19 pandemic. Results showed that policymakers should be aware that face masks might contradict the Western understandings of social encounters. The study indicated that face masks were perceived as a symbol of social disruption inconsistent with Swiss culture. For instance, the notion that social exchange was impaired with face masks as facial expressions were more challenging to read was perceived as an essential cost. Consequently, face masks were only temporarily perceived acceptable, and it appears important that face mask mandates are only enforced when epidemiologically necessary in countries where they are not already culturally embedded (31). A rapid review aimed to examine associations between children wearing masks and COVID-19 incidence results. It showed that wearing masks in children is associated with a reduced incidence of SARS-CoV-2 infections in schools. Studies have shown lower transmission levels when masks (and other measures) have been used (32).

A literature review provided evidence in favor of widespread mask use to reduce community transmission as nonmedical masks are made of materials that obstruct droplets of specific sizes. People are most infectious in the initial post-infection period, where it is common to have few or no symptoms. Nonmedical masks have been effective in reducing the transmission of influenza and have been shown to be effective in blocking the transmission of coronavirus in small trials. Where and when mask usage is required or widespread, substantially lower community transmission has been observed. The evidence indicates that wearing masks reduces the transmissibility per contact by reducing the transmission of

virus-carrying droplets in both laboratory and clinical settings. Public mask-wearing is most effective at stopping the spread of the virus when compliance is high. Decreased transmissibility can substantially reduce the mortality rate and economic burdens while the cost of the intervention is low (33).

In a study, researchers indicated that most environments and contacts have low virus abundance (are virus-limited) where surgical masks are effective at preventing virus spread. More advanced masks and other protective equipment are required in potentially virus-rich indoor environments, including medical centers and hospitals (34). A review aimed to explore the pros and cons of face masks in preventing the spread of SARS-CoV-2 and other pathogens. It indicated that the application of face masks in public was considered only as a temporary measure for several perceptive groups of people, not as a substitute for established precautionary procedures. There is an urgent need to search for alternatives with higher efficacy than current face masks. Face shields and social distancing may be better substitutes for face masks for some people due to reasons such as COPD acute and chronic respiratory diseases, outdoor exercise, old age, underlying medical conditions, and hypercapnia sensitivity. However, further clinical studies are required (35).

A review of the effectiveness of face masks and their rational use showed that wearing a mask could reduce the traveling distance of droplets to half of that without a mask (36). A systematic review (n=35 studies) assessed the efficacy and effectiveness of using masks in a community setting in reducing the spread of COVID-19 or other similar diseases. Robust randomized trials on face mask effectiveness are needed to inform evidence-based policies. However, this study, as well as observational studies on the association of wearing face masks with

a reduced risk of primary infection in RCTs, did not achieve strong evidence. However, it should be noted that the wide confidence intervals might have affected the statistical significance of the overall estimate (37). Results of another review indicated that during epidemics, medical masks, and if not available, appropriate homemade masks should be universally used when physical distancing is not possible. Together with other IPC measures, it can increase community protection and empowerment (38).

A review showed that wearing a mask could reduce the traveling distance of droplets produced to half of that traveled without a mask. Wearing surgical masks and gloves for longer than a few hours is not recommended, and they should be properly and carefully discarded to prevent cross-contamination (39). In an opinion paper, researchers suggest that face masks use should be as universally used (i.e., nationwide) as possible and implemented immediately, even if most masks are homemade and of relatively low quality. This measure could contribute greatly to controlling the COVID-19 pandemic, with its benefits the highest in conjunction with other non-pharmaceutical interventions (such as physical distancing) that reduce community transmission. However, covering the lower half of the face reduces the ability to communicate, interpret, and mimic the expressions of those with whom people interact (40). A review (n=12 primary studies) showed that medical face masks should be used by sick and healthy individuals to prevent respiratory infection transmission (41).

A review of the literature offered evidence in favor of the widespread use of masks as source control to reduce community transmission. Nonmedical masks are made of materials that obstruct droplets of specific sizes. People are most infectious in the initial post-infection period, where it is common to have few or no symptoms.

Nonmedical masks have been effective in reducing the transmission of influenza and have been shown to be effective in blocking the transmission of coronavirus in small trials. Where and when mask usage is required or widespread, substantially lower community transmission has been observed (42).

### 3-2. How does a face mask works

- COVID-19 spreads mainly among people in close contact.
- There are droplets in coughs and sneezes that can carry COVID-19 to others.
- Coughs spray droplets at least six feet. Sneezes travel as far as 27 feet. Droplets also may spread during talking or raising the voice.
- These droplets can land on the face or in the mouth, eyes, and nose.
- When an individual wears a mask, it keeps more of their droplets from spreading.
- A mask also adds an extra layer of protection between an individual and other people's droplets (43, 44).

### 3-3. Types of masks

- CDC recommends wearing a high-quality mask to help protect against COVID-19, including variants like Omicron. Examples of high-quality masks are N95 and KN95 masks, which are highly efficient at blocking droplets. Surgical masks also provide better protection than cloth masks.
- If these types of masks are not available, a mask with two or more layers of tightly-woven fabric can be used. A disposable mask can be layered under a cloth mask to increase effectiveness. The cloth mask should press the edges of the disposable mask snugly against the face.

- Wearing a high-quality mask is immunocompromised or at high risk of becoming severely ill from COVID-19.
- Face coverings made of thinner, loosely woven, or single-layer fabric are not recommended, such as certain types of masks, scarves, neck gaiters, or bandannas. They are not as effective in blocking droplets when speaking, coughing, or sneezing. It is recommended to wear a mask under a scarf or neck gaiter for warmth.
- Any masks that incorporate a valve designed to facilitate easy exhaling, mesh masks, or masks with openings, holes, visible gaps in the design or material, or vents are not sufficient face coverings as they allow droplets to be released from the mask.
- Look for masks with nose wires. They can improve fit and help reduce gaps or holes (45, 46).

### 3-4. How to wear a mask

- Wash the hands before putting on the mask and after taking it off.
- A mask should cover the nose and mouth completely and fit snugly against

even more crucial if the individual is the face without gaps. The mask should not be overly tight or restrictive and should feel comfortable to wear (**Figure 1**).

- For children of two years and older, find a mask that is made for children to help ensure proper fit. Children younger than two should not wear a mask.
- If an individual wears glasses, a mask that fits closely over the nose or one that has a nose wire to limit fogging should be used.
- Do not touch the mask when wearing it. If one has to touch or adjust the mask often, it does not fit properly, and it may be necessary to find a different mask or make adjustments.
- A cloth mask must be washed each time after wearing.
- If reusing an N95 or KN95, store it in a paper bag. Do not wash an N95 or KN95 between uses. Refer to instructions that came with the mask for information on when it should be replaced.
- Do not wear a mask that is dirty, damp, or damaged (47-49).



Fig. 1: How NOT to wear a mask (47).

### **3-5. Tips for wearing and taking care of masks**

- Wash the hands before putting on the mask. Try not to touch the eyes, nose, or mouth when putting on and taking off the mask. Hold the mask by the outer surface and ear loops or head straps as much as possible. Avoid touching the inside of the mask.
- A mask should fit so that there is no need to adjust it or otherwise touch the face frequently. It should fit the face snugly so that ideally, unfiltered air cannot escape from gaps.
- If the mask gets dirty, wet, or is hard to breathe through, take it off and use another one. Throw the dirty mask away if it is disposable. If it is reusable, wash it with regular laundry before wearing it again.
- Before eating and drinking, wash your hands, then take the mask off using the ear loops or head straps. Place the mask in a safe place. After eating, wash your hands before putting the mask back on.
- To store the mask when not using it, carefully fold it so that the inside does not touch anything else. The mask can be stored in a clean paper bag or another breathable container (50, 51).

### **3-6. Reasonable accommodations**

- People with disabilities, behavioral needs, or other health, mental health, or developmental conditions may have difficulty wearing a mask or other face coverings safely.
- People who have trouble breathing, are unconscious, or are unable to remove a mask without help should not wear a mask.
- Children younger than two should not wear a mask.
- Certain situations (e.g., swimming or other activities that soak or submerge a

face covering in water) may make masks unsafe (52).

## **4- CONCLUSION**

This study aimed to review the studies on the use of the mask and examine its advantages and disadvantages using relative articles, journals, and official guidelines. Results showed that the use of masks is recommended for diseases transmitted through airborne droplets and respiration, but the regular use of the mask in the community is not recommended by the WHO, CDC, or ECDC.

Masks are one of the protective measures against infection and prevent the transmission of coronavirus among the community. Masks are especially important for people who have a medical condition or are taking medications that weaken their immune system and thus may not be fully protected against COVID-19 even if they are up-to-date with COVID-19 vaccinations (1, 25, 27). The novel coronavirus (COVID-19) can infect others through droplets that are projected into the air when the infected individual speaks, coughs, or sneezes. The risk of COVID-19 transmission through droplets is higher when people are close to one another (3, 37, 38). The results of a study in Hong Kong showed that the transmission rate of the new coronavirus through respiratory droplets or airborne particles is reduced by 75% when using medical masks (53).

The results of another study showed that if medical masks are used properly, the possibility of spreading the virus from the respiratory tract is reduced by 100%, and if 80% of people use masks in public places, it is not possible to transmit the virus (54). Evidence suggests that if 80% of people wear a mask in public, COVID-19 transmission could be halted (55). Another study showed that unfitted surgical masks were 100% effective in blocking the seasonal coronavirus in droplets ejected during breathing (56).

Credible guidelines and numerous studies in this field recommend wearing a respirator in certain situations and when certain people need or want greater protection. These include:

- When caring for someone who is sick with COVID-19;
- If the person is at increased risk for severe illness, such as the immunocompromised, older adults, and people with underlying medical conditions;
- When working at a job where one interacts with a large number of people, especially when not everyone is consistently wearing a mask, such as bus drivers and grocery store workers;
- When riding on planes, buses, trains, or other forms of public transportation, especially for a long time on and where people are not able to observe social distancing;
- When physical distancing is not possible or when one is in crowded indoor or outdoor public settings; or
- If one is not up-to-date with COVID-19 vaccinations (1, 6, 25, 43-50).

It should be noted that masks are not a replacement for social distancing measures or vaccination. People should continue trying everything possible to prevent the coronavirus infection, including avoiding close contact with other people, washing their hands frequently, and regular air-conditioning in houses and places such as schools, banks, and offices with open windows. It is also important for health authorities to provide clear guidelines for the production, use, and sanitization or reuse of face masks and consider their distribution as shortages allow. Clear and implementable guidelines can help increase compliance and bring communities closer to the goal of reducing and ultimately stopping the spread of COVID-19.

## 5- CONCLUSION

Scientific findings indicate that wearing a mask properly is effective against the COVID-19 spread. However, reputable health organizations such as the WHO and the CDC recommend using masks in crowded environments (such as public transportation) and for high-risk people (the elderly, pregnant women, and people with underlying diseases). The best way to protect from COVID-19 and its variants is to stay up-to-date with the COVID-19 vaccination, which means receiving a primary series and booster doses when eligible, as recommended by the CDC. In addition, while COVID-19 is still actively circulating, wearing a mask maximizes the protection and helps prevent the spread of COVID-19.

Wearing a mask is especially important if the individuals are not fully up-to-date with their vaccinations. People should also adhere to their local mask mandates and continue following other standard COVID-19 safety measures whenever possible (e.g., staying at least six feet away from others, not touching the face, washing and sanitizing hands often, air-conditioning).

**6- CONFLICT OF INTEREST:** None.

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