



General Awareness Regarding Face Masks to Combat Covid-19: A Comprehensive Review

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ABSTRACT

The pandemic, coronavirus disease (COVID-19) due to SARS-COV-2 also called severe acute respiratory syndrome coronavirus 2, is directly related to bat SARS. Higher risk of spread can be caused due to prolonged exposure to a carrier person and shorter contacts with symptomatic individuals as briefer contacts with asymptomatic contacts are less inclined to transmission. The transmission can be either presymptomatic or asymptomatic. Wearing a face mask is becoming a requisite, in hospitals as well as community settings in this context as it can reduce the SARS Co-2 transmission rates. Masks has to be worn regularly and correctly to keep away from getting the virus. China recommended everyone to wear face masks and cloth masks to the ones less likely to spread or contract the infection when the current pandemic Covid-19 got outbursted. During this pandemic, when countries are facing shortage of resources, it is necessary to adopt and implement policies to ensure the balance of demand and supply to reduce the infection transmission rates. The irrational usage of surgical and the FFP masks by the general public has resulted into a shortage of their supply for the health care workers who need them the most, across the world. Awareness should be created among the public about the necessity of using face masks, selection of the mask, rational use in accordance with the situation, proper discarding of disposable masks, and other control measures that has to be kept in mind to prevent virus transmission. Face shields (Personal protective equipment-PPE) which are used by the healthcare providers in combination with face masks or respirators for eye protection, helps reduce transmission of the virus through respiratory droplets through the mucous membrane of the eyes offering a partial protection to the facial area.

Keywords: Covid-19, Face mask, General awareness, Transmission, Public settings, Clinical settings.

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INTRODUCTION

The pandemic, coronavirus disease (COVID-19) due to SARS-COV-2 also called severe acute respiratory syndrome coronavirus 2, is directly related to bat SARS. It is the second pandemic of the 21st century after the influenza A and H1N1 pandemic, 2009. With the rapid dash of epidemic due to international travel and globalization, World Health Organization declared COVID-19 a pandemic on 11 March 2020, 72 days after the first official declaration of patients with community-acquired pneumonia in Wuhan, China on 31 December 2019. By 8 April 2020, as of day 100, 80,000 deaths and more than 1.35 million people have been infected throughout the world. In response to these proactive infection, control measures were implemented in hospitals. In this situation, the usage of face masks has become mandatory and essential part of our day to-day life to protect ourselves

against the attack of the virus and to further prevent the spread of the virus.¹

METHODOLOGY

This review includes data related to importance of face masks in various public as well as clinical settings especially during this Covid-19. This review also includes data regarding the proper selection of the mask, correct usage, discarding the disposable masks, different types of masks and their efficacy. This information was collected through computerised search from research article and various guidelines related to the importance of face masks in this Covid situation using various journal sites and health care organizations.

Transmission of the SARS-CoV-2 virus

As new evidence accumulates, knowledge about transmission of the SARS-CoV-2 virus is rapidly getting updated. The clinical effects of the respiratory disease Covid-19 includes severe acute respiratory illness, sepsis with organ dysfunction and death. The available evidence shows that the virus can spread between people who are infected to those non infected when they are in close contact which depends on the extend of viable virus that are expelled by a person as small liquid particles while coughing sneezing, singing, talking and breathing heavily. It also depends on the type of contact they make with others and can spread even from contaminated surfaces.



Contacts in close range of 1 metre can pave way for the virus entry through mouth, nose or eyes. There is a chance of aerosol spread which in humans are indistinct. Presymptomatic carriers are the reason for 48% to 62% of the total transmission.²

Higher risk of spread can be caused due to prolonged exposure to a carrier person (within 6 feet for at least 15 minutes) and shorter contacts with symptomatic individuals (eg. coughing) as briefer contacts with asymptomatic contacts are less inclined to transmission. Aerosol which can transmit to a larger distance through air currents with longer lifespan are formed from the respiratory droplets, they can also keep the SARS-CoV-2 viable for 3 hours.³

The time between exposure to the virus and symptom onset, that is, the incubation period for Covid-19 can range from 5-6 days to even 14 days.^{4,5}

The transmission can be either presymptomatic or asymptomatic. Presymptomatic transmission can occur from people who have not yet developed any symptoms but are infected and shedding virus. Available data shows that even 1-3 days before developing symptoms, people exposed to virus may test positive for SARS-CoV-2 via polymerase chain reaction (PCR) testing. The viral loads in the people who develop symptoms appear to be high on the day prior to symptom onset, than at a later stage of the infection.⁶

Asymptomatic transmission can occur from people who do not develop symptoms but are infected with SARS CoV-2. One systematic review published recently shows that 20% of the people were asymptomatic during the entire infection period whereas another systematic review showed 17% of the cases to be asymptomatic among the 13 studies they considered. Even the people who do not develop any symptoms may act as carriers of the disease were proved when viable virus were isolated from the specimens of people who were presymptomatic and asymptomatic.⁶

The WHO report in February, 2020 stated the rates of asymptomatic carriers to be small and they were not counted among the drivers of virus transmission. But later on, tests of nearly 3000 people from northern Italy gave positive pharyngeal results, even when the people were asymptomatic. This paved way to testing all the immigrants to China, of which among the 166 positive cases, 78% were asymptomatic. The respiratory tract viral load of the asymptomatic patients and those with the symptoms were reported to be the same.¹⁴

Wearing a face mask is becoming a requisite, in hospitals as well as community settings in this context as it can reduce the SARS Co-2 transmission rates. *“The surgical face mask has become a symbol of our times.”* was the headline of an article in the New York Times on 17th March 2020 indicating the role face masks has to play in this Covid-19 outbreak. Thus the rudimentary non pharmaceutical intervention (NPI) step of wearing a face

mask acts as the most effective means to prevent respiratory infectious diseases, reducing the infection risk.⁷

In this context of Covid-19, the World Health Organisation recommends the face mask use to be the most effective measure towards the prevention and limiting the spread of SARS CoV-2. Even if used correctly, the mask alone do not provide adequate protection. Hand hygiene, physical distancing of at least 1 metre, dodging of touching one's face, respiratory protocols, adequate ventilation in indoor settings, testing, contact tracing, quarantine and isolation are the other infection prevention and control (IPC) measures to prevent the human to human transmission of the virus. All these measures together are critical to tackle this situation.⁸

The Centre for Disease Control and Prevention (CDC) recommends the use of masks specifically non-valved, cloth masks with multi-layers to be secured under the chin covering the nose and mouth in public settings especially at events or gatherings, in mass transportation and anywhere in public. It is not recommended for children two years and younger, people with troubled breathing and for people who cannot remove it on their own.

Selection of mask

There are many factors to be considered while selecting a mask. Those include selecting masks that are of breathable fabric and washable, should have two or more layers, should cover the nose and mouth completely, and should snugly fit against the sides of face without any gap.

Correct usage of mask

Masks has to be worn regularly and correctly to keep away from getting the virus. Before putting on the mask, it has to be ensured that hands are washed and also not to touch the mask while wearing it. Masks should not be worn on the neck, forehead or chin.

How to clean the mask

Masks has to be removed correctly and washed on a regular basis including them under regular laundry using a detergent. Also it has to be ensured that hands are washed properly soon after touching or handling a used mask. After washing, the masks has to be left in the drier under highest heat setting to dry them completely.

Who should not wear a mask

Masks should not be worn by children younger than two years, people with troubled breathing, unconscious, incapacitated, and people unable to remove mask on their own. People with sensory, cognitive, or behavioural issues may find it difficult in wearing masks. In these cases, alternatives has to be sought out.

Things to be kept in mind

• People two years and above have to wear masks compulsorily in public settings and when are not around people of their household.



- In case if you get infected unknowingly, using masks can protect people around you.
- Social distancing of atleast 6 feet has to be maintained and masks should not be substituted for social distancing.
- Hands has to be washed for atleast 20 seconds with soap and water or a hand sanitizer containing atleast 60% alcohol has to be used soon after touching or removing the face mask.
- Masks has to be used even if no symptoms are seen, as studies shows that asymptomatic individuals (who never develop any symptom) and even the pre-symptomatic individuals (the people who has not yet started showing any symptom) can act as carriers and spread the disease to other people.⁹

Different types of masks

In this pandemic, as per WHO, the different type of masks available include:

- Fabric mask or cloth mask (masks for everyday use): These masks fits against the face with the help of either ear loops or ties around the head. It should be multi layered which could then protect the wearer from the external environment. The thicker the mask is, greater is the protection it offers. It do not grant complete protection, but still using these masks can reduce the rate of getting infected or spreading the infection during exhalation, substantially reducing the droplet transmission. These cloth masks are generally recommended for the community setting and not recommended in the health care setting.¹⁰
- Procedural and Surgical masks (MNP – medical mouth nose protection): The primary intention of using these masks is to provide protection against large respiratory droplets specifically aerosols from coughing and sneezing and hence intended to protect the patient. In a study, the filtration efficacy of surgical masks was found to be 77.6 to 97.7% offering moderate to high protection against air particles in the range of 500 to 1000nm.^{10, 11}
- N95 Masks / FFP2 masks (Face filtering piece): They provide greater protection compared to other masks. It can prevent the entry of >95% of particles and droplets during inhalation. Masks without exhaling valve offer greater protection and are more effective whereas masks with exhaling valve contaminates the environment as it lets out the exhaled air unfiltered.
- FFP3 Masks: These masks offer even more protection as it can filter out >99% of the droplets and particles and offer protection to the immediate environment if exhaling valve is not present.

As per WHO, the inappropriate use, improper handling, poor maintenance, and repeated use of disposable masks

can further deteriorate the efficacy of these masks against the virus.¹⁰

Mask management

To ensure each mask to be as effective as possible, it should be used, stored and cleaned appropriately and proper disposal is also essential to reduce the risk of transmission. Adherence to the proper use of masks is essential to combat this pandemic.¹² The WHO guidance on the proper use of masks include:

- Wash hands with soap and water or use sanitizer before the mask is put on.
- It has to be ensured that the mask is not torn or holed to not use a damaged mask.
- The mask has to be put on carefully, covering the mouth and nose, adjusting the nose bridge and tying it securely to ensure it fits snugly against the face.
- While wearing the mask, avoid touching it, or even if touched accident, ensure to do hand hygiene.
- While removing the mask, take it out from behind without touching its front.
- Do not continue using the same mask once it has got damp, instead replace it.
- The masks should not be worn around the chin or neck and also it should not be used around the arm or wrist. Either it has to be discarded or stored in a re-sealable bag until it is washed.
- Hand hygiene should be performed soon after discarding the mask.
- Single use masks should be used only once.
- Single use masks should be regularly discarded and properly disposed.
- The masks should not be removed while speaking.
- The masks should not be shared.
- The cloth masks has to washed regularly with soap or detergent and hot water (60°C). If washing with hot water is difficult, after washing with soap and room temperature water, boil the mask for about one minute.

Efficacy of different types of masks

Jefferson et al. in a systematic review of physical interventions towards controlling the propagation of the disease, concluded N95 masks to be non inferior to surgical masks and also stated that wearing a mask can act as a barrier to the virus transmission.¹³

Depending on the material of the cloth masks, the susceptibility of the wearer to infectious droplets were much minimized through filtration of up to less than 10 microns were demonstrated in some studies.

Studies showed that there were much variation among the filtration capacities of different masks when differences in



experimental design and particle size were analysed. Multi layered cloth masks with greater thread counts proved to be more effective in filtering out nearly 50% of fine particles of less than 1 micron when compared to masks that were single layered with lesser thread counts. Filtering effectiveness can further be enhanced on using materials like polypropylene by generating triboelectric charge, a form of static electricity which has varying functions like capturing of charged particles, repelling moist droplets, reducing the wetting of the fabric, and providing comfort and easy breathing.⁹

Even though surgical masks filter out large droplets and sprays, it has limited filtration ability against airborne particles of submicron size. And also it cannot be determined whether these masks can prove to be effective against aerosols <5 micrometre in diameter.

The effectiveness of both surgical and N95 masks against influenza like illness and laboratory confirmed influenza were found to be similar in a meta-analysis of randomized controlled trials by Long Y et al. Seto WH et al. also conducted a case control study in Hong Kong hospitals to compare the effectiveness of surgical and N95 masks and brought forth similar results.¹⁴

No significant differences were observed in the systematic reviews when the filtration effectiveness of N95/P2 masks were compared against medical masks in health workers with symptoms of respiratory illness, influenza like illness, or laboratory confirmed influenza. Slight discomfort were only reported, which were due to low compliance.^{15,16} It should be ensured that, N95 respirators are used for risky aerosol generating procedures to limit its supply in all settings.¹⁷

On using face protective masks like N95 and similar respirators, it was concluded in a systematic review of observational studies on virus that cause SARS, MERS, and Covid-19 that the risk of infections were much lowered among health workers which suggests the greater efficacy of these masks against medical or 12 to 16 layer cotton masks. This study however had fewer limitations like recall bias, insufficient information on the situations of respirator use, inadequate measurement of exposures and inclusion of fewer studies evaluating the risk of Covid-19 transmission in the review.¹⁸

77% reduction in risk of infections on using either a medical or non-medical mask were observed in a case control study from Thailand.¹⁹ Numerous other observational studies with data on infectious diseases also reported similar results in the reduction of transmission of the virus in public settings.²⁰ A decline in the spread of the infection was reported in many other studies too of which some were peer reviewed.²¹

Rational use of face masks

Face masks were in use in the Asian countries like South Korea, Japan, China, and Thailand against pollution and

since the respiratory illnesses like SARS and H1N1 got outbursted.

China recommended everyone to wear face masks and cloth masks to the ones less likely to spread or contract the infection when the current pandemic Covid-19 got outbursted.

During this pandemic, when countries are facing shortage of resources (surgical masks, N95, and other respirators), it is necessary to adopt and implement policies to ensure the balance of demand and supply to reduce the infection transmission rates.

The United States Centre for Disease Control and Prevention also recommended the use of cloth mask for general public to prevent the transmission of the virus and also discouraged them to use surgical masks to reserve them for the health care workers to prevent their shortage and irrational usage. Even other countries like United Kingdom, New Zealand, and Singapore also took measures to conserve the surgical face masks for the health care workers.

India also adopted a modest approach towards preventing the virus transmission advising people to wear cloth masks in public setting along with scrupulous hand hygiene.²²

The irrational usage of surgical and the FFP masks by the general public has resulted into a shortage of their supply for the health care workers who need them the most, across the world. Thus it has become the need of the hour to create awareness among the general public about the indications of each type of masks so that their use can be optimised.²³

The governments and the public health agencies should make recommendations on the rational use of masks together with hand hygiene measures. It has been recommended by WHO to use face masks to the people with symptoms of respiratory illnesses or if they are caring for someone with these symptoms. The people in quarantine also are recommended to wear masks when they leave home in order to rationalise the mask use to prevent the virus transmission. The people who are at high risk like the older adults and people with comorbidities are also recommended to wear masks. The universal use of face masks has to be encouraged without limiting its supply. Studies has to be undertaken urgently to know about how long the different types of masks can offer protection and also to increase the duration of effectiveness of disposable masks.²⁴

Even complete lockdown of the cities or the countries or imposing extreme social distancing on the people would not always prove to be practical and can also also disrupt the country's economy. But universal masking can be an efficient method in slowing down the transmission rates of the virus and also acts to be practical method in public settings, where social distancing is not possible. Adherence to the strict use of masks globally can bring forth early better outcomes. To conserve the surgical and N95 masks



for the frontline health care workers, the US Centre for Disease Control and Prevention strongly recommend healthy individuals to adhere to the use of cloth masks in public settings.¹⁴

To systematically advertise universal masking

Awareness should be created among the public about the necessity of using face masks, selection of the mask, rational use in accordance with the situation, proper discarding of disposable masks, and other control measures that has to be kept in mind to prevent virus transmission. Any of the measures alone is not sufficient or do not guarantee complete protection. Therefore other measures such as hand hygiene, avoiding gatherings, social distancing etc. has to be followed along with the use of face masks. The awareness about these can be created through TVs, newspapers, through social media such as Facebook, twitter, Instagram, and even through display screens in public places and conducting seminars and training.³

Benefits and harms of face masks

The advantages include:

- Minimization of the transmission of virus particles through respiratory droplets even from an asymptomatic person.
- Enhanced acceptance of mask wearing without any social stigmas to help prevent infection spread to others or to take care of covid-19 patients in community settings.
- Making people aware that they have a great role in the prevention of virus transmission by strictly adhering to the use of face masks and other control measures like hand hygiene.
- Minimising the chances of occurrence of other respiratory diseases like tuberculosis and influenza during this pandemic, which would then complicate or worsen the condition.

The disadvantages include:

- Breathing difficulties and headache that are associated with the mask use.
- Dermatological problems like acne, skin irritation, facial lesions etc. on continuous long hours use.
- Uneasiness
- Difficulty in communication especially in case of non-verbal communication.
- Poor conformity in children.
- False belief that face masks alone can provide adequate protection and non adherence to other control measures
- Problems with waste management when masks are disposed improperly in public places.

Many people like mentally challenged, cognitive impairment, other severe respiratory diseases like asthma or COPD may find it uncomfortable to use masks.²⁵

Alternatives to medical masks in health care settings

Taking into consideration the increasing concern of shortage of medical masks like surgical masks or N95 masks, alternative measures has to be sought out. In this regard, the disease commodity package (DCP) of WHO recommends Type II medical masks for the healthcare workers which has a filtration efficacy of $\geq 98\%$ compared to type I masks that filters out $\geq 95\%$ of particulate materials. In case of shortage of type II masks, Type I masks can be considered as an alternative.

Face shields (Personal protective equipment-PPE) which are used by the healthcare providers in combination with face masks or respirators for eye protection, helps reduce transmission of the virus through respiratory droplets through the mucous membrane of the eyes offering a partial protection to the facial area.²⁵

CONCLUSION

Face masks has become the need of the hour for protection against the SARS CoV-2 virus and to prevent the transmission of the virus. The correct use of masks along with other control measures such as hand hygiene and social distancing is of utmost importance in limiting the spread of the virus. Proper care has to be taken while selecting the mask, wearing the mask, removing the mask from the face, and discarding of the disposable masks. The complete lockdown of the cities or the countries or imposing extreme social distancing on the people would not always prove to be practical and can also also disrupt the country's economy. In such a situation, universal masking can be an efficient method in slowing down the transmission rates of the virus and also acts to be a practical method in public settings, where social distancing is not possible. Hence the universal use of face masks has to be encouraged and publicized without limiting its supply. At the same time, the medical masks has to be conserved for the frontline healthcare workers. Studies also has to be undertaken urgently to know about how long the different types of masks can offer protection and also to increase the duration of effectiveness of disposable masks.

Abbreviation:

WHO –World Health Organisation

PCR- Polymerase Chain Reaction

IPC- Infection Prevention and Control Measures

CDC- Centre for Disease Control and Prevention

MNP- Medical Mouth Nose Protection

FFP- Face Filtering Piece

SARS- Severe acute respiratory syndrome

MERS- Middle East respiratory syndrome

COPD- *Chronic obstructive pulmonary disease*

DCP- Disease Commodity Package



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