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## Role of Mask in Prevention of Infection - A Review

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N. NAVEENAA<sup>1</sup>, LAKSHMINARAYANAN ARIVARASU<sup>\*2</sup>, LESLIE RANI<sup>3</sup>

<sup>1</sup>Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu.

<sup>2</sup>Assistant Professor, Department of Pharmacology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical And Technical Sciences, Saveetha University, Chennai, Tamil Nadu.

<sup>3</sup>Lecturer, Department of General Pathology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science, Saveetha University, Chennai, Tamil Nadu, India.

\*Corresponding Author

Email:151801079.sdc@saveetha.com<sup>1</sup>, lakshmin.sdc@saveetha.com<sup>2</sup>, leslieranis.sdc@saveetha.com<sup>3</sup>

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**Abstract:** The personal protective equipment is used in the prevention of infection during pandemic. Non pharmaceutical intervention intervention is like masks play a major role in the prevention of community spread of infection. There are different types of March which have different functions and should be indicated only for certain people, not any person can wear any type of mask. The role of face mask has played a major role in controlling and prevention of spread of disease through aerosol contamination in COVID- 19. It is a key control, which drops down the respiratory infection of virus spread and not only for COVID-19, it was highly used for tuberculosis, influenza patients and the doctors who treat them. Appropriate choosing and using it and a disposal mask is very important as wearing a mask to prevent infection. This review emphasises the need, use of appropriate mask in infection control. With the possible literature masks are used as a key in prevention of infection at community level but there is an acute demand which arises due to improper use so it is essential in choosing a proper mask so that the resources are available for the entire population.

**Keywords:** Face mask; prevention; infection control; health care; community.

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### INTRODUCTION

The personal protective equipment will protect the users against the risk factors that cause serious workplace illness and injuries (Ong *et al.*, 2020). This could result in injuries and illness depending on the contact like blood splash, aerosol contamination, physical, chemical, mechanical or even other workplace hazards (Casanova *et al.*, 2008). These personal protective equipment includes gloves, mask or respirators, vests, full body suit, headwear, earplugs, safety glasses (Lombardi *et al.*, 2009). These personal protective equipment must be designed in such a way that they are easy to clean, sit comfortably and reduce the risk of exposure to the disease (Casanova *et al.*, 2009). There are certain questions which have to be considered in the case of PPEs, when it is necessary, how to wear it and dispose, the limitation of the second base and finally proper care (Visentin *et al.*, 2005).

A face mask is a personal protective equipment which is used to prevent the infection due to droplet spread (National Academies of Sciences, Engineering, and Medicine *et al.*, 2019). The role of face mask has played a major role in controlling and prevention of spread of disease through aerosol contamination in COVID- 19. It is a key control, which drops down the respiratory infection of virus spread and not only for COVID-19, it was highly used for tuberculosis, influencing patients and the doctors who treat them (Leung *et al.*, 2020). Mask has become a topic of debate as there are various health agencies and the government recommends not everyone needs a mask. What about 88% of the global population in various countries have made it mandatory to wear a face mask (Longrich, no date). And then debate has begun when, where and who needs a face mask to prevent a viral spread in COVID-19 pandemic (Brosseau and Sietsema, 2020). And different countries had different protocols in application of face masks. This non-pharmaceutical intervention is useful for reducing the spread of respiratory viruses (Jefferson *et al.*, no date). These Non-pharmaceutical interventions are now highly recommended by various health agencies, government, WHO, CDC to prevent the infection which still persists (COVID-19) ('CDC health information for international travel: the yellow book, 2012', 2011). It was also important to maintain hand hygiene with alcohol based soap, using proper tissues when coughing or sneezing and most importantly to avoid hand contact with the face, especially the individuals who wear a mask. This non-pharmaceutical intervention helps to prevent the community spread at the early stage of pandemic but on the other hand the pharmaceutical interventions like vaccines, medicines are highly

effective against any type of pathogenic species(Aiello *et al.*, 2012). But the non-pharmaceutical intervention is found to be cheap, non-invasive, and reduces mortality through respiratory infection.

In spite of having a huge advantage in prevention and controlling the infection, there is increased evidence shown that even with the application of face masks, people contribute to the spread of disease and infections even from asymptomatic, pre-symptomatic individuals(Ganyani *et al.*, no date). Sadly this is the current scenario with the Corona virus spread. But certain studies have shown that the normal face used by the general population of Asian countries during SARS, COVID-19, has reduced the risk of infection by 76% in countries like China(Leung *et al.*, 2005). So there are both uses and adverse effects of using a mask.

Even after using the equipment there is a chance of acquiring the infection so it is very important to keep our body and our immune system healthy(Anitha and Ashwini, 2017; Ashwini, Ezhilarasan and Anitha, 2017). There exist various herbal plants which exhibit numerous activities which could improve our immunity(Lakshmi *et al.*, 2015)(Sharma *et al.*, 2019)(Ezhilarasan, Lakshmi, Vijayaragavan, *et al.*, 2017; Sharma *et al.*, 2019)(Perumalsamy *et al.*, 2018) so that our body can resist the pathogenic substance and can exhibit defence mechanisms against it. *Mangifera indica* along with zinc oxide nanoparticles exhibits antioxidant and cytotoxic properties(Rajeshkumar, Venkat Kumar, *et al.*, 2018). Certain research is done using nanoparticles which in combination with these plants give better properties like antimicrobial, cytotoxic, antioxidant(Ezhilarasan, Lakshmi, Nagaich, *et al.*, 2017)(Ezhilarasan, 2018a)(Ezhilarasan, Evraerts, *et al.*, 2017)(Ezhilarasan, 2018a; Gheena and Ezhilarasan, 2019a). So staying healthy is very important to keep our body against pathogens to fight them during the pandemic condition. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018b; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar *et al.*, 2018; Rajeshkumar, Kumar, *et al.*, 2018; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019b; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran *et al.*, 2019; Rajeshkumar *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020)

This review focuses mainly on the personal protective equipment like mask which helps to control the community spread and prevention of infection. It also summarises the evidence related to the effectiveness of non-pharmaceutical intervention like masks in the prevention of respiratory illness and highlights the needs of a mask, different mask available to provide a framework for further interventions as face masks are in a state of demand during the outbreak of pandemic.

### **Different masks used in infection control**

There are different masks available from least to most protective ones which include cloth face masks, medical mask, surgical mask, respirators like N95 mask and filtering face mask(Long *et al.*, 2020). Masks are made up of different materials like cotton and even other fabrics and these include the non-medical mask. This mask is used at the community level for the prevention of infection.

The cloth mask, usually made up of cotton, common textile fabrics are less effective than the medical mask, they are recommended by the health authorities to the general public as there is a shortage of supply in medical grade masks. These cloth masks are used by middle and low income countries(Chughtai, Seale and MacIntyre, 2013). Interestingly these cloth masks are used by Chinese health care workers during the SARS pandemic(Yang *et al.*, 2011). These masks are commonly made with one layer, two layers or two layers with pockets which are featured to have a removable filter in the inter layer (Liang *et al.*, 2020). But CDC recommends to use more than one layered mask.

The surgical face mask creates a barrier between mouth, nose and they are further classified as surgical, isolation, dental and medical mask(Kumar *et al.*, no date). They are available in different thickness which acts as a shield to prevent the entry of microorganisms. But it must also be noted that they must not be used more than once. It helps to block large particle droplets, spray, splash containing pathogenic species(Peng *et al.*, 2020; Wang, Pan and Cheng, 2020). But this mask doesn't block or filter out very small particles in the air.

N95 respirators on the other hand are made up of synthetic polymers which were earlier designed for industrial purpose. It is one of the most effective personal protective equipment designed in a way to have a better and close facial fit and more efficient filtration of particles. CDC recommends and N95 respirators must be used by the health care workers and not be used by the general public. It has the ability of filtering 95% of the airborne particles(Godoy *et al.*, 2020). Not everyone gets an appropriate fit, a layer of Vaseline is coated over the edges of the mask to have reduced edge leakage.

### **Awareness about important of a mask**

Face masks are a protective shield which prevents respiratory infection and it acts as an effective barrier in the prevention of aerosol spread of disease during pandemic conditions. It acts as a primary preventive measure in

the community level(Sim, Moey and Tan, 2014). Let's associate the importance of face masks by considering various results of its related literature. When a research was conducted to evaluate the usage of mask to prevent SARS spread and Hong Kong, it was found to be the older age belonging to 50-59 were ready to wear a mask (68%) and 19-29 years were least likely to wear face mask and the study concluded that those who wore mask were likely to prevent themselves from acquiring and spreading the disease and those young people were least likely to wear a mask(Taylor *et al.*, 2009).

Another study revealed that those who are highly educated were highly associated with the habit of wearing a mask. The survey conducted in traditional markets in Taiwan, it was found that the participants who have a higher educational knowledge were found to use masks not all in that market(Kuo, Huang and Liu, 2011)for the practical prevention of risk factors associated with influenza.

Another study which is a gender based one was collected during the SARS outbreak in China which revealed that women are more likely to wear a face mask and men(Tang and Wong, 2004). Similarly during the H1N1 outbreak women were the ones who wore face masks regularly in public places(Lau *et al.*, 2010). Based on the area of residence, the studies have shown that there are certain differences associated between mask wearers in rural and urban areas. It was found that the people in rural areas are more likely to face masks. Based on the above few literature the awareness about the importance of face masks is not rationally known by the people. There are people who didn't wear a face mask knowingly and unknowingly due to lack of awareness during the outbreak of pandemic. So proper awareness must be provided to everyone to ensure the use of face masks.

### **Recommendation of using a mask**

Various health organisations have recommended that people must use a mask in such a way that it covers mouth, nose so that the particles do not go out during coughing or sneezing. The surgical masks are recommended for those who are infected and can expose the risk of spreading to the public and those who treat the infected people(Team *et al.*, 2020). The WHO has recommended the usage of masks for those who take care of the infected person and who is at the high risk of exposing themselves to the disease like healthcare workers(Cheng and Khan, 2020). But on the other hand CDC has recommended even the general public to use at least cloth masks in public areas to prevent the community spread as there is a huge risk of spreading of disease through the asymptomatic and pre-symptomatic carriers(Boyce and Pittet, 2002). In countries like China, disposable nonsurgical medical

masks are recommended to be used By Health members of the population During the Outbreak Of COVID 19. In many Asian countries like Japan, South Korea, the governments have recommended the use of face masks in public. But earlier on the onset of COVID 19 pandemic, countries like Italy and few european countries didn't initially recommend mass only after the less factors increased with death, the application of masks was made compulsory(Leung, Lam and Cheng, 2020).

### **Mask management**

Appropriate choosing and using it and a disposal mask is very important as wearing a mask to prevent infection. It is important to ensure the effectiveness of face masks. To reduce the risk of transmission of Infection associated with incorrect use and disposal of masks.

There are various protocols followed in proper management of mass which includes:(Mahmood *et al.*, 2020)

- Place the mass in such a way that it covers the mouth and nose and ensure that there aren't any gaps.
- Don't reuse the single use mask.
- Disposal of single use mask immediately after removing them must be done.(Park *et al.*, 2020)
- After removing hand hygiene is must and should be washed with proper alcohol based soaps.
- While using a mask, ensure that the mask is not touched after.
- Not to use a single mass more than six hours for medical workers as they say masks used for treating multiple patients can again result in infection.

### **Challenges**

The face-masks are enormously helpful for human beings in infection control but still there are challenges faced like rational use of facemasks aren't done as there is a high risk of spreading of disease from the asymptomatic individuals even after wearing a face mask(To *et al.*, 2020). Another important problem associated with the face mask is the shortage of face masks. In China there was an increased demand for face mass due to increased public demand. This resulted in lower supply of masks to Healthcare workers and they would be in a higher risk of acquiring the infection. There was an acute Shortage of N95 and FFP masks during COVID-19 pandemic(Lepelletier *et al.*, 2020). There exists only a specific time duration in Wearing a mask, which includes not more than six hours and treating the patient without changing them causes reinfection. And the important quality of a mask is to have a proper fit, but in one out of every four individuals only has a proper fit, so this could also increase the risk of infection frequently touching the face during the application of the mask can cause higher frequency of infection.

### Future scope and concerns

By considering the surrounding circumstances the ongoing outbreak can be controlled Only by facing the challenges and how to improve techniques in solving these challenges. So when we consider the personal protective equipment like masks, there must be proper implication of policies and practises must be done to reduce the transmission of pathogenic species and provide a disease free environment. WHO has been helping the healthcare workers to understand the course of transmission, adequate training to combat the situation and to provide knowledge about rational use of PPEs. Use the resources in a proper way to stay healthy. And it is important to take a healthy rich diet to protect our body against the infection and fight against them. There are ample herbal plants with good properties and combining them with the nanoparticles(Menon *et al.*, 2018)(Sujatha, Asokan and Rajeshkumar, 2018)(Rajeshkumar, Agarwal, *et al.*, 2018) (Karthiga, Rajeshkumar and Annadurai, 2018)(Mehta *et al.*, 2019)nowadays gives better results to humans so it can be taken to enrich our own body in spite of using these equipment as a safety measure.Our institution is passionate about high quality evidence based research and has excelled in various fields ( (Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

### CONCLUSION

Masks are used often as a shield to protect oneself but it is better at least now to think broadly so that we can control the droplet infection in a combined level by appropriate and rational use of facemask. And most importantly the medical mask must be reserved for health care workers.As the degree of exposing themselves is comparatively more. And proper awareness must be provided To the public as still there exist certain people Who are unaware of masks but there are certain people even after knowing the ill effects they aren't using. So proper awareness must be done and choosing an appropriate mask should be done to prevent the wastage of resources. So this is non pharmaceutical Intervention is useful, cheap and aids self protection. So staying healthy, taking proper diet and using of proper PPEs will stabilize proper life to oneself

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