Review Article

Role of mask in COVID-19 pandemic

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Abstract

Use of face mask is a common practice around the world, especially in countries like China & India. The general public uses a face mask as a measure to prevent breathing in dust or airborne particles. In Covid-19 Pandemic, there has been a debate going on the different type of mask usage or to whether all people should wear mask considering the mask shortage for Health care workers. Public health agencies have advised the general public to use homemade cloth mask when in public and World Health Organization (WHO) have released guidelines on when and which mask to use when taking care of suspected or confirm coronavirus patient. Business and communities have stepped up in providing resources to the health care system to help fight in this pandemic. Many country governments have regulated warning face mask or covering up mouth and nose when in public. Overwhelming Health care system around the world has come up with ways to manage with limited resources. Shortage of mask has led to black marketing and price gouging of this life-saving Personal Protective Equipment (PPE).

Keywords: Face Mask, COVID-19, WHO, Personal Protective Equipment (PPE), SARS-CoV-2 virus, N95, Healthcare worker/Caregiver

1. Introduction

In this Covid-19 pandemic, mask plays an important role in controlling the spread of SARS-CoV-2 virus. Mask helps prevent the spread of infected air droplets and may also prevent breathing in those droplets depending on the type of mask used. Generally, there are two types of a mask being used in this pandemic, Surgical mask & N95 Mask that we are using to fight the spread of the virus.

Mask alone should not be used as a measure to reduce the spread of the virus. There are a couple of things that we need to follow to make sure we reduce the chances of spreading & contracting the virus.

- Proper use mask & disposing of used mask
- Regularly hand washing
- Coughing or sneezing in flexed elbow or tissue
- Staying at home or following social distancing guidelines

Surgical Mask (1)

The surgical mask was designed to prevent the spread of the liquid droplets or aerosol from the wearer's mouth and nose. They were not designed to prevent the wearer

from breathing in airborne virus or bacteria. However surgical mask work as effective as respirators, such as N95 for infections like influenza. These masks are made of a nonwoven fabric created using a melt blowing process.

It was intended to be used by health care workers but for the past couple of years in a country like China and India, it's commonly used by the general public to reduce the chances of spreading or contracting airborne diseases and to prevent breathing in dust particles.

In 1960 they came into the market and replace cloth facemask. But in this pandemic, due to a shortage of such masks, the general public is using a homemade face mask. Previously to avoid shortage & hoarding of mask many public health agencies announced the general public should only use a mask if they are sick. But later due to spike in cases and new research that asymptomatic patients can infect other so public health agencies revised their guidelines for the general public to wear mask regardless of whether they are sick or not.

2. The risk involved with using a surgical mask (2)

Due to shortage of N95 mask healthcare workers are using a surgical mask while taking care of COVID-19 patient increasing their risk of contracting the disease.

N95 Mask (3)

N95 masks are rated to filter out at least 95% of airborne particles and is designed in a way to make a seal around wearer's mouth and nose to protect them breathing unfiltered air. They are made of a fine mesh of synthetic polymer fibres, with non-woven polypropylene fabric and it is produced by the melt blowing process.

They were originally designed for use in industries such as mining, construction and painting. Now they are also used by healthcare workers. World Health Organisation (WHO) recommends the use of N95 mask for medical professionals taking care of a COVID-19 patient.

The risk involved with using an N95 mask (2)

The N95 mask is not designed to wore for prolong hours but due to COVID-19 pandemic healthcare workers are using an N95 mask for prolong hours. Prolong hours use of the mask can cause the wearer to be oxygen-deprived due to Carbon dioxide build-up inside the mask in the absence of exhaust valve. It is also uncomfortable to wear for long periods due to its tight fit around the face. It may not provide a proper seal with people having facial hairs.

Homemade cloth mask (4)

A homemade mask is generally made of a handkerchief, cotton cloth or any kind of fabric of single layer or multiple layers. Due to the shortage of surgical masks and N95 masks, the general public is using a combination of homemade cloth masks, surgical mask, N95 mask, KN95 mask, W95 mask, etc.

The risk involved with using a homemade cloth mask (2)

Every fabric has its capacity of filtering out air particles. Even with multiple layers of common fabric,

they do provide much protection. Allowing airborne particles to inhale through a cloth mask.

Black marketing of N95 mask

Every country in the world is trying to get its hands on the N95 mask. In this Covid-19 pandemic, it's prices have gouged up by up to 700%. (5) Mask markets are now filled with fake and stolen face masks. (6)

In India National Pharmaceutical Pricing Authority (NPPA) allowed manufactures gouge prices by max 3 times its original price to ensure stock and reasonable pricing. (7)

Shortage of mask

No one was prepared for this pandemic. Due to the contagious nature of this SARS-CoV-2 virus, many countries Healthcare system is overwhelmed leading to the shortage of mask. Many jurisdictions have stopped selling mask to other nations due to its shortage. (8)

To optimize the use of masks healthcare workers are using N95 mask beyond their manufacturer designated shelf life. (3)

Many businesses and communities have stepped up to provide the healthcare system with PPE (Personal protective equipment). Several people with different communities have come forward help cover up the shortages of PPE equipment, ventilators, etc. Many businesses & communities have contributed by building, funding or donating 3d printed face shield band, Open Source design ventilator and other life-saving equipment's. (8,9)

3. World Health Organisation (WHO) guidelines on the use of face mask within the Health Care System

WHO has come up with guidelines to manage with the limited resources healthcare system have. Following are the guidelines published for the use of types of mask in different scenarios. (10)

Table1. Usage of mask in different scenarios

Transmission Scenario	Involved Personnel	Caring facility	Patient Scenario	Type of mask recommendation
Confirmed or suspected community transmission	Healthcare worker/Caregiver	Health Facility	Patient area	Medical mask
	Non-medical staff	Health Facility	-	Mask not required but recommended if the proximity of 1m of patients
	Healthcare worker	Home	Direct contact with patient/1m distance proximity cannot be maintained	Medical mask
	Healthcare worker	Community	Community programs	Medical Mask
Covid-19 transmission	Healthcare worker/Caregiver	Health Facility	Any patient care	Medical mask
	Healthcare worker	Community	Community	No mask needed

			programs	
Any Transmission	Healthcare worker/Caregiver	Health Facility	In contact with confirmed/suspected Covid-19 patient	Medical mask
	Healthcare worker	Health Facility	Aerosol generating procedures for Covid-19 patients	Respirators
	Healthcare worker/Caregiver	Home	Direct contact with confirmed/suspected Covid-19 patient and 1m distance cannon be maintained	Medical mask

The table above refers to the usage of mask in different scenarios. Usage of the mask needs to be combined with other personal protective equipment, other measures and hand hygiene.

World Health Organisation (WHO) varying guidelines on mask usage for the general public (11)

WHO have regularly revised their guidelines on the use of a mask. In the start of the pandemic to avoid shortage masks, they told the general public to wear mask only if they are sick. This was a good strategy to avoid the shortage but this led asymptomatic Covid-19 positive patient to continue spreading virus without knowing.

Later when cases surged and it spread globally. They later revised its guidelines to ask the general public to wear a homemade cloth face mask and insist on not using certified N95 mask and leaving them for use by Health care workers or Front line workers only.

Despite their guidelines on not using the mask if you are not sick, several countries local health organizations made it compulsory for the general public to wear a mask when out in the public.

They have published some research on what kind of fabric is best suited for making a homemade mask and recommends at least 3 layers of fabric to improve its filtration capacity (10)
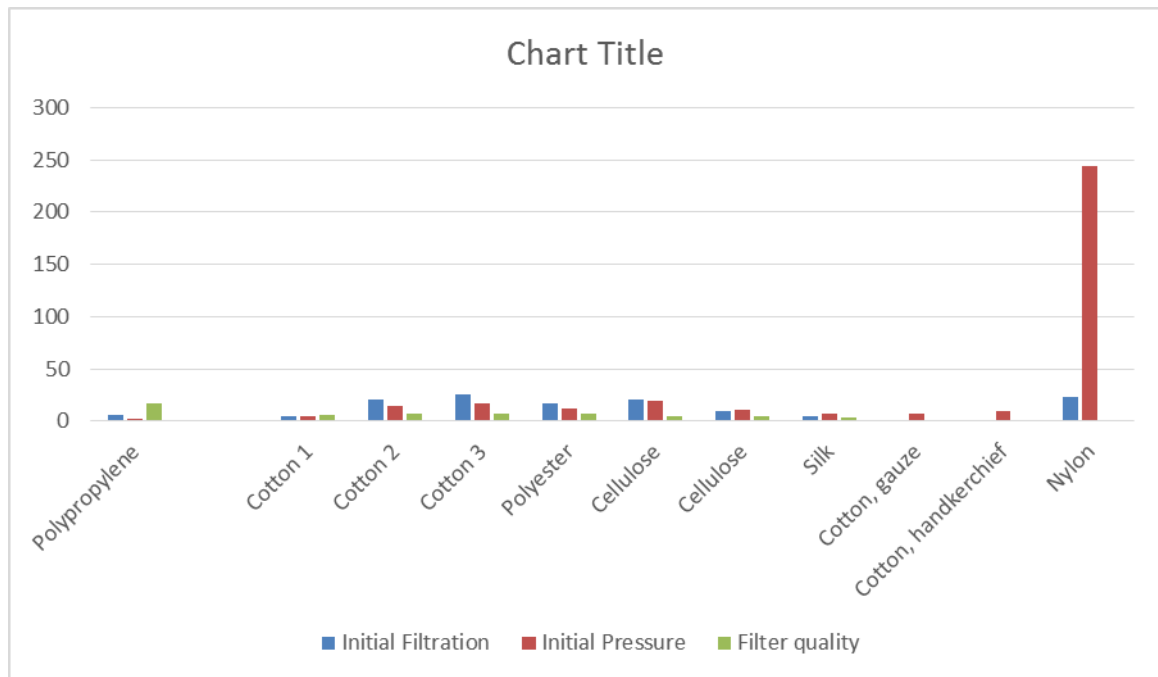

Figure 1. Kind of fabric used to improve its filtration capacity

4. Mask regulation's around the world (12)

About 88% of the world's population and more than 75 countries have mandated the use of a mask when in public by their respective governments.

Table 2. Mask regulations around the world (12)

Country	Regulation announced/ enforced on	Regulation
Argentina	14th April 2020	• Mask compulsory for the general public by Capital Buenos Aires • Fines for Violators

		• Prohibition on sale N95 Mask to non-medical workers

Austria	14th April 2020	• Mask mandatory for public entering
		    ○ Supermarket
		    ○ Grocery store
		    ○ Drug store
		    ○ Public transport

Bahamas	19th April 2020	• Mandatory of Mask wearing or face covering with cloth in public • Employers must provide a mask to their employees

Bahrain		• Mandatory wearing of a mask when in public for
		    ○ Citizen
		    ○ Residents
		    ○ Shop workers

Benin	8th April 2020	• Mandatory wearing of a mask
Bosnia and Herzegovina		• Mandatory wearing of a mask
Bulgaria	30th March 2020	• The government passed an order for mandatory wearing of a mask • An order cancelled the next day and changed into a recommendation
Cambodia		• No Regulation • The public started wearing a mask soon after the outbreak in Wuhan • Business requires its customers to wear a mask
Cameroon	6th April 2020	• Mask recommendation
Canada	6th April 2020	• Mask recommendation where physical distancing not possible • On 7th July 2020, Toronto made it mandatory to wear mask indoors
Chile	8th April 2020	• Mandatory wearing of a mask in public
China		• Shanghai: Mandatory wearing of a mask in public • Hong Kong: Mandatory wearing of a mask in public • Some local governments require mask in public
Colombia		• Per the World health organisation (WHO) guidelines, Colombia changes its policy and mandate the use of a mask when in public transport
Croatia	8th July 2020	• Mandatory wearing of a mask when in enclosed places like shops and other buildings
Cuba	11th March 2020	• Mask wearing recommended by the government in public • Carry multiple cloth mask depending duration they are going to spend outside • Later it was made mandatory to wear a mask in public
Chez Republic		• Forbidden stepping outside without wearing the mask until 25th May 2020
Dominican Republic	16th April 2020	• Mandatory wearing of a mask in public and workspace
DR Congo	20th April 2020	• Mandatory wearing of a mask in public
Denmark		• No regulation or recommendation of wearing a mask in public • A handmade mask is advised against a surgical mask • Since 25th June 2020, Mask is mandatory at all airports
Ecuador	8th April 2020	• Mandatory wearing of a mask in public places
Egypt	30th May 2020	• Mandatory wearing of a mask in public places and on public transport • Fine for violators up to EGP4,000
Ethiopia		• Mandatory wearing of a mask in public places • Regulation that outlaws' handshakes
France		• The government announced million of the mask will be made available for the general public and medical workers
Gabon	10th April 2020	• Mandatory wearing of a mask in public places
Germany	31st March 2020	• Change in a previous recommendation that only symptomatic patient should use a mask • Mandatory wearing of a mask in a public place and transport
Guinea		• Mandatory wearing of a mask
Honduras	7th April 2020	• A mandatory covering of mouth when outside
India	3rd April 2020	• Principal Scientific Adviser advised the government to ask healthy people to wear a mask in public especially in a densely populated

		area.
		• Many states like Odisha, West Bengal, Uttar Pradesh and Maharashtra made it mandatory to wear a mask in public
Indonesia		• Mandatory wearing of a mask when outside
Ireland	18th May 2020	• Recommended cloth face-covering in enclosed public spaces
Israel		• Mandatory wearing of a mask in public
Italy		• Mandatory wearing of a mask before stepping out in Lombardy and Tuscany
Ivory Coast	26th April 2020	• Mandatory wearing of a mask when entering shopping malls or supermarkets in Southern suburb of Abidjan
Japan		• Manufactures required to sell mask to government • The government will distribute to residents
Kenya	4th April 2020	• Mandatory wearing of a mask
Liberia	21st April 2020	• Mandatory wearing of a mask in public
Lithuania	10th April 2020	• Mandatory wearing of a mask or covering nose and mouth when in public places
Luxembourg	20th April 2020	• Mandatory wearing of a mask in places where social distancing is not possible
Malaysia		• The government distributed 4 masks in each household to be used only if they have symptoms
Mexico	17th April 2020	• Mandatory wearing of a mask when inside stations or trains
Mongolia		• Mandatory wearing of a mask in public transportation in Ulaanbaatar
Morocco		• Mandatory wearing of a mask
Mozambique	8th April 2020	• Mandatory wearing of a mask in all forms of transport and public gatherings
North Macedonia	22nd April 2020	• Mandatory mask and gloves waring in public places indoors or outdoors in areas like markets and shops
Pakistan	18th April 2020	• Mandatory wearing of mask or cover their faces
Panama		• Mandatory wearing of a mask when outside
Peru	7th April 2020	• Mandatory wearing of a mask when outside
Philippines	2nd April 2020	• Mandatory wearing of a mask in areas under quarantine
Poland	16th April 2020	• A mandatory covering of lips and nose when leaving the house
Russia		• Mandatory wearing of a mask
Rwanda	20th April 2020	• Mandatory wearing of a mask when in public and at home
Serbia	29th June 2020	• Mandatory wearing of a mask in public indoor places and public transportation
Singapore	14th April 2020	• Mandatory wearing of a mask
Spain	4th May 2020	• Mandatory wearing of a mask when in public and transportation
Slovakia	15th March 2020	• Mandatory wearing of a mask when in public • Since 20 May 2020, wearing a mask is no longer required if social distancing of 5 meters is maintained between people
Slovenia	29th March 2020	• Mandatory wearing of a mask • Mandatory gloves wearing in indoor public places
South Africa	10th April 2020	• Covering of nose and mouth when in public is mandatory
South Korea	25th May 2020	• Passengers in transport are required to wear a mask
Sweden		• No regulation of mask • Warning against use of the mask as it may create a false sense of security
Taiwan	1st April 2020	• Mandatory wearing of a mask for passengers • Violators will be fined
Turkey		• Mandatory wearing of a mask in markets
Ukraine	6th April 2020	• Mandatory wearing of a mask in public places
United Kingdom	15th June 2020	• Mandatory wearing of a mask in public places
United States	26th April 2020	• Mandatory wearing of a mask in most public places by 11 states
Uzbekistan		• Mandatory wearing of a mask in public • Violators will be fined $22 (First offence) and $67 for a repeated offence
Venezuela		• Mandatory wearing of a mask in public places

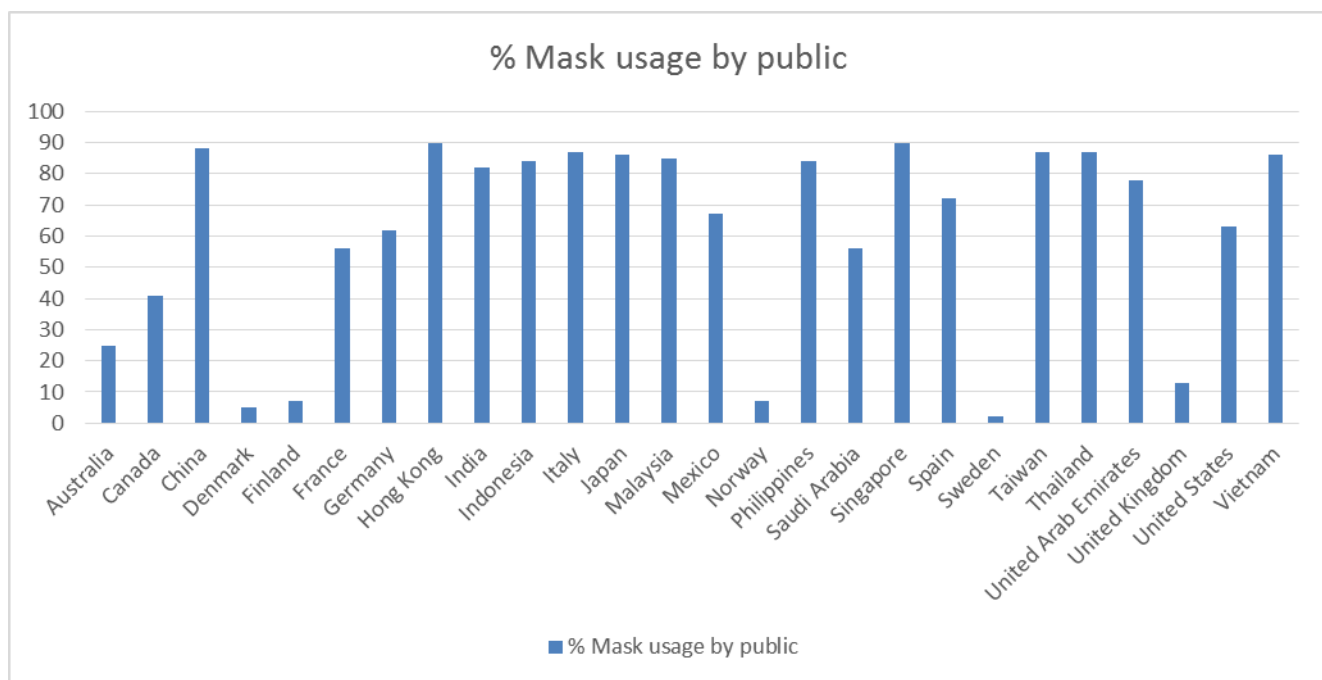| **Vietnam**	16th March 2020	• Mandatory wearing of a mask in public places1
Zambia		• Mandatory wearing of a mask

Figure 2. Mask usage by the public in several countries

Which mask should general public use? (12)

There has been a lot of debate about the use of the different mask in the general public but it is advised by World Health Organisation (WHO) & many other public health agencies to use homemade cloth mask. They have stated that the protective effect of the homemade mask is not known but may protect the spread of the virus and decision-makers should assess their usage on the risk-based approach.

Which mask should Health Care workers or Front-line workers use? (10)

World Health Organisation (WHO) has given guidelines to be followed to manage with limited resources. Which states to use N95 mask when taking care of (in proximity) confirmed Corona Virus patient.

5. Conclusion

Back to the beginning point, Mask alone can't protect us from the SARS-CoV-2 virus. Despite using a mask,

the virus can enter our body through eyes, mouth or nose. By using a mask and following social distancing, Regular hand washing can we truly avoid contracting SARS-CoV-2 virus.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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