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# Types of face coverings (masks) and coronavirus disease 2019 (COVID-19)

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**ABSTRACT:** The ongoing pandemic has been increasing slowly and steadily across the world. The SARS-CoV-2 spreads through droplet disseminated from infected persons via coughing and/or sneezing onto the face, nasopharyngeal, and oropharyngeal mucosa. In order to prevent the transmission of coronavirus disease, WHO and public health officials made policies, advised the health workers and public to wear face coverings (masks). The nature of masks depends upon the source, material, structure and particulate efficacies. The main objective of this study is to provide information about efficacies of different types of masks used during COVID-19 pandemic.

**Keywords:** Pandemic; Policies; Masks; Types; Prevention; COVID-19; Efficacies.

## 1. INTRODUCTION

The coronavirus disease (COVID-19) was emerged from Wuhan's sea food market of Hubei Province, China, in ending December 2019 [1]. The virus spread overall world within short time span [2] and on January 30, 2020, the WHO confirmed the disease as a Public Health Emergency of International Concern [2, 3]. Coronaviruses (CoVs) is a large group of viruses belongs to the family Coronaviridae primarily causes various enzootic infections in birds as well as in mammals but, in the previous few decades, humans shown susceptibility to the potential of coronavirus infection as well.

The recent epidemics of two deadly viral diseases MERS and SARS confirmed the virulence of CoVs when they penetrated species barrier and contaminate the most valuable creature on earth, the humans [3-6]. Genetically CoVs are a diverse group with positive ssRNA as a genetic material, coated with a capsid [7, 8].

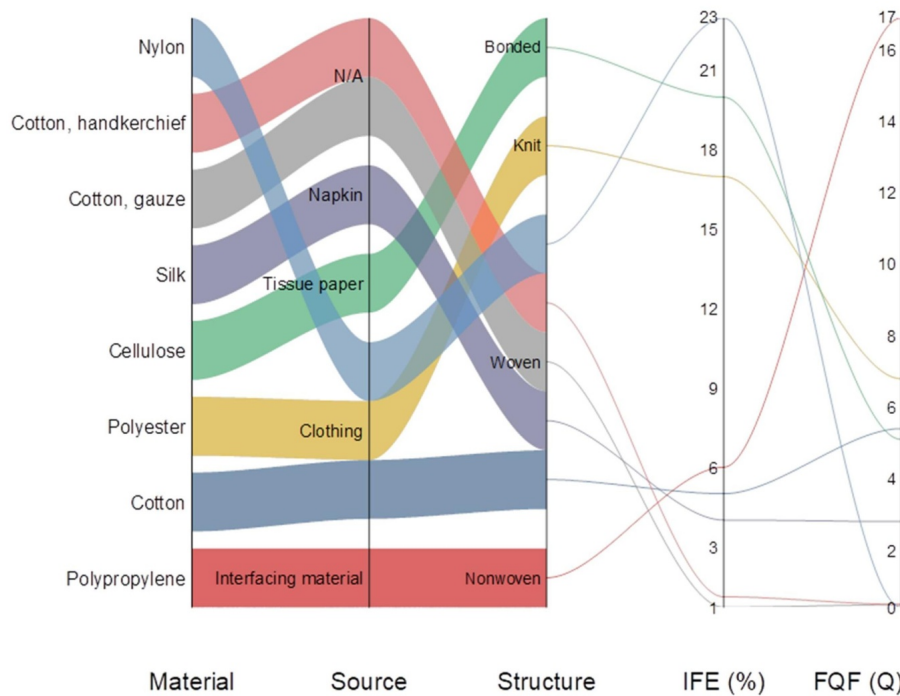
Fever, fatigue, and cough are the main symptoms of COVID-19 which are similar to symptoms of SARS-CoV and MERS-CoV diseases. There is distinctness in etiology and pathogenesis of these CoVs which causes severe diseases in humans [9].

The counties are doing everything to combat the spread of this virus. Every day people are affected by its symptoms and are finding positive. Therefore, medical professionals have recommended taking care of hygiene, washing hands regularly, sanitizing, and wearing face masks to prevent its virus. For personal protective equipment (PPE) only the fit and seal tested respirators are consider as gold standard against contaminated droplet transmission [10, 11]. The filtration efficacy of mask or respirator depends upon

material used in making the mask or respirator and size of penetrating particles. In the context of SARS-CoV-2, a virion spherical having diameter ca. 125 nm [12, 13]. There is approximately 99.5% filtration efficacy of N95 respirators for particles 750 nm in size [14]. Similarly, other respirators such as N99 and N100 have filtration efficacies of 99% and 99.7% for particles 100–300nm in size, respectively [15, 16]. However, the filtration efficacies of surgical facemasks ranging from <10% to ≤90%.

**2. DIFFERENT TYPES OF FACE MASKS USED TO PREVENT SPREAD OF CORONAVIRUS**

During the current COVID-19 pandemics people are wearing different types of face masks to combat the COVID-19 cases. These face-covering masks minimize the effects of virus contaminated droplets which are spread through sneezes, coughs and oral conversations. The set of standardized test methods (ASTM F2100, EN 14683, or equivalent) are required to test the performance level of masks that aim to maintain high filtration, adequate breathability and also fluid penetration resistance [17, 18]. The parallel plot (Figure 1 by using the software Origin 2019b 64Bit) showing the mask material, source, structure, initial filtration efficiency (IFE), and filter quality factor (FQF) (also known as ‘Q’ factor).



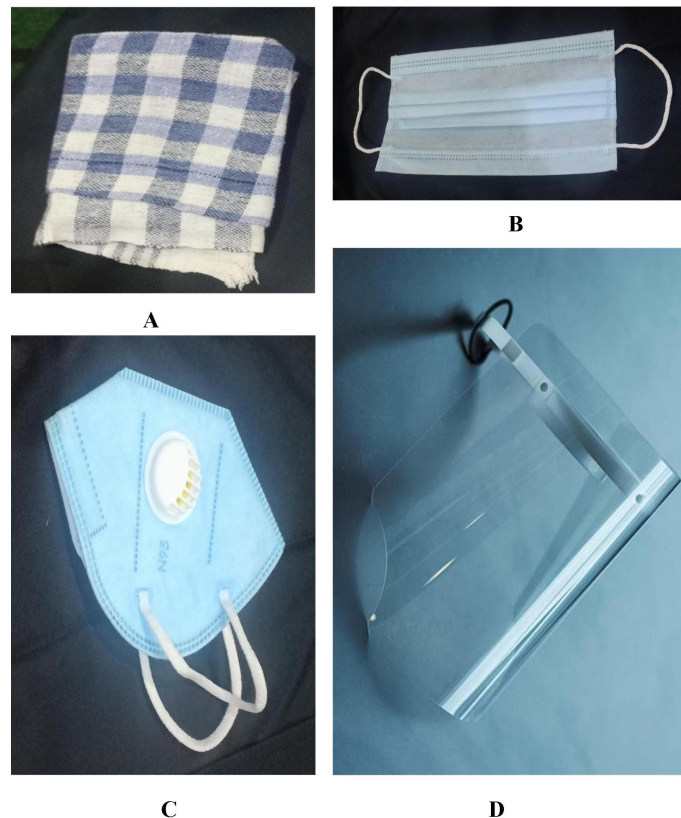
**Figure 1.** Mask material, source, structure, initial filtration efficiency (IFE), and filter quality factor (FQF) (Q). Reported in experimental peer-reviewed studies, according to expert consensus, three (3) is the minimum Q factor recommended [28].

**2.1. Simple cloth face mask**

This face mask is recommending for public use in this coronavirus crisis. It is a standard, everyday use face mask. You can wear it while going out buying groceries or any other open public place [19]. Filtration efficiency of cloth mask made of different fabric varies from 2% to 38% [20]. Cloth mask possesses a filtration efficacy and combating viral infection transmission half as the N95 mask and 25% lesser than surgical mask [21].

## 2.2. Bandana (color kerchief)

A bandana is a typical square piece of colored cloth made of either cotton or any other material as shown in Fig. 2A, used as a neck or head covering for general purpose. However due to shortage of standard masks and money during COVID-19, the general public used it as a substitute of face covering mask. Wearing it over nose and mouth helps in preventing the entrance of dust particles, pollens and virus contaminated droplets into the respiratory system. Hence, this piece of cloth also offers some protection against influenzas and different CoVs [22]. The filtration efficacy of bandana or handkerchiefs depends upon the layers (2% for single layer to 13% for four layers) [23].



**Figure 2.** Different types of face covering masks: A - Bandana (color kerchief); B - Disposable surgical mask; C - N95 face mask; D - Face shield.

## 2.3. Disposable surgical masks

Surgical masks are thin, flat and paper like, usually come in white and light blue color as shown in Fig. 2B. It has a filtration efficiency of 55% [23]. It can also help to stop droplets, splatters and sprays spread. It decreases the fear of getting affected from the exposure of coronavirus disease. The wearing of masks in public gatherings can lower the transmission of coronavirus disease. However, surgical masks are disposable and can be used for few days, so should be disposed after use [24].

## 2.4. N95 face respirator mask

N95 face respirators (Fig. 2C) provide the more protection against coronavirus and other respiratory diseases. This particular mask filters about 95% of particles from the air that you breathe in. Hence, these

masks possesses a filtration efficiency of >95% [23]. It has been seen that vented N95 respirators comparably reduce the spread of coronavirus disease because of their efficacy at blocking expiratory particle emission [25].

### **2.5. Filtering face piece respirator**

This respirator is like a surgical mask. It doesn't stop the spread of airborne infections, but it is used to reduce exposure to particles that has a source from pollens and dust. If a person has allergy problems can use this during the pandemic [26].

### **2.6. Full-length face shield**

A full-length face shield mask is a plastic in composition and transparent in nature (Fig. 2D). Generally it has been worn by welders during their working hours. It covers entire face with a cushioned headband. Generally, it isn't ideal during pandemic crises as it's tough to breathe [27].

## **3. DISCUSSION**

It has been suggested that the proper and on time use of face masks could reduce the fatality rate during ongoing COVID-19 pandemics than when it is not used. The use of different types of masks could reduce the chance of COVID-19 transmission [29-31], SARS [32], Influenza [33, 34], and MERS [35]. Among all masks, N95 respirator mask seems to provide a better protection from respiratory infections like coronaviruses and influenza when used continuously, rather than intermittently [36-38]. There should be a precaution while using the cloth masks as it has an ability of greater moisture retention and in case if the cloth masks did not decontaminated properly it may results in increased risk of infection [39,40]. Paper mask (disposable surgical mask) also gets easily moistens and ultimately disintegrates hence classified as worst [41]. This, therefore, means that cloth mask after used for some time it must be washed and then dried or ironed to lower the risk of contamination.

## **4. CONCLUSION**

This study highlights the use of different type of face masks with varying particulate efficacies used during the COVID-19 to prevent the transmission of disease among people. It has been demonstrated that, use of different types of face masks provides dual benefits; oneself being protected and also protects others from coronavirus transmission. So, if everyone wears a face mask in public assemblage, it promotes a double protective system against COVID-19 transmission. The use of N95 respirators among all masks provides better safety from coronavirus disease, as its particulate efficacy is above 95%. Controlling the spread of COVID-19 could not only save lives but prevent possible reintroduction of lockdowns, curfews and other SOPs, also ensure that health systems are not overwhelmed with severe cases of COVID-19.

### **Abbreviations**

MERS – Middle-East respiratory syndrome

SARS – Severe Acute Respiratory Syndrome

CoVs – Coronaviruses

WHO – World Health Organization

SOPs – Standard Operating Procedures

COVID-19 – Coronavirus Disease 2019

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