

## Editorial

## Are Facemasks Safe in COVID Crisis?

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## Editorial

Everything has changed with the onset of COVID. This pandemic has transformed societal norms. People have developed different and changed ways of living. In these pandemic times, face masks have become an important item, deployed as a major way by which people can protect themselves and others from coronavirus infection. Though covering the face is not a new culture but now the facemask has attained a new practical meaning. Face masks are an important component of personal protective equipment to prevent potentially infectious respiratory infections especially the latest coronavirus. Face masks have become a fashion item and people are choosing specific coloured masks for use which suits along with their clothes. But the question is whether the prolonged use of facemasks is safe? Until now, there are not many comprehensive investigations pointing out the adverse health effects associated with facemask use. Though wearing a mask has become a part of routine life, its extended use may lead to health risks. The present short communication points out the available scientific reports revealing the positive and negative aspects of facemask usage.

Typically, face masks are deployed to trap particles or vapours in a porous material called a filter in order to avoid their transmission between humans. Apart from the type of filter, size and shape of the mask is an important aspect which determines its efficiency. But, if the mask is improperly fit or the resistance to airflow through the filter is high, a part of the air along with the particles and vapours will leak through the space between face and mask. Another important aspect associated with wearing a mask is that it mixes expired air having higher carbon dioxide levels with the inspired air. Thus, the subject may receive less of the oxygen than it would have received without the mask. This may lead to elevated concentrations of inspired carbon dioxide resulting in mild hypercapnia. A study demonstrated that wearing a mask during a sensory-motor task may alter the Blood Oxygen Level Dependent (BOLD) contrast in gradient echo functional magnetic resonance imaging. This happens because wearing a mask can lead to an increase in the carbon dioxide concentration in the inspired air. A change up to 30% in gray matter BOLD signal baseline was found associated with air modulation. Further investigations demonstrated an average rise in End-tidal carbon dioxide values by 7.4% after wearing a mask [1]. Another recent study points out the fact that exercising with facemasks may reduce available oxygen. Prolonged use of facemasks during exercise promotes air trapping within the mask thereby preventing required carbon dioxide exchange [2].

Role of facemasks in times of COVID has been the subject of debate and controversy. Recommendations from different agencies for the use of facemasks are conflicting across the world [3]. A study shows that wearing a simple cloth mask can be helpful in decreasing the transmission of viral particles in a significant manner [4]. In a study, an online survey was done among the residents of Germany, China, Switzerland and Austria about the self-reported facemask use and the related fields. 655 online appropriate answers were checked and it was found that the Chinese and Europeans showed a greater tendency towards facemask usage [3]. Though this is a good practice, there are some studies which highlight the ill health effects of using facemask for longer times. One of these studies assessed effects of prolonged use of facemask on healthcare workers of tertiary care hospital. 250 participants, using either N95 or surgical masks for a minimum of four hours per day filled out a self-constructed questionnaire regarding the effects of its prolonged use. After going through the responses, it was found that participants encountered some conditions like acne (56.0%), excessive sweating around the mouth (67.6%), exertion related breathing difficulty (58.2%) and itchy nose (52.0%). This study suggested that prolonged use of facemasks may result in increased risk of infections [5]. Along with the healthcare staff, patients are also at risk of exposure to different viruses and bacterial strains; and must use facemasks to avoid any transmission. Another study investigated the bacterial growth in the periocular area around the surgical face masks used by patients who received intravitreal injections which is a route of administration of drug into the vitreous humor of the eye. 40 patients using facemasks were considered in two groups viz. patients using facemasks for less than 4 hours and patients using facemasks for more than 4 hours. The bacterial load in the periocular area was found to be significantly higher in the second group as compared to the first (48.75 vs 13.2 Colony Forming Units/ $\mu$ L). This study suggested that wearing a surgical face mask for 4 hours or more may result in higher moisture accumulation and bacterial infections around the eyes in patients receiving intravitreal injections [6]. However, a part of this research emphasizing the infection around the eyes may be applicable to facemask use by the general public. Recently, we are witnessing various reports for the occurrence of mucormycosis around the eyes of the patients.

The World Health Organization supports facemasks only for COVID-19 patients. But there seems to be a lack of knowledge about the appropriate use of masks including the time for which a facemask should be worn continuously. A part of another study by Han and Park on the knowledge and behavior of facemask usage in older adults revealed that older adults used a single mask for an average of 3.55 days which reflects the lack of knowledge among the participants of the study [7]. On the same line, use of facemasks during physical exercise is a debatable matter. People are using facemasks of different materials or N95 while exercising which are still under debate. Use of facemasks during exercise may pose significant health risks. A latest study reveals that using facemask while exercising may alter different physiological systems including circulation, respiration and even

immune responses. Exercising with a facemask on builds up higher concentrations of carbon dioxide in the bloodstream resulting in a hypoxic condition. This may lead to substantial increase in the acidic environment and higher loads on cardiac as well as renal systems [2]. This study recommends the practice of social distancing as a better solution than use of facemasks during exercise. Another study used the term 'mask fatigue' for the experience of lack of energy after using a facemask for a prolonged time [8]. Similarly, a study refers to the Mask-Induced Exhaustion Syndrome (MIES) as a result of extended facemask usage. This study revealed significant changes in respiratory physiology in the subjects using masks. A significant association was found between fatigue and oxygen drop ( $p < 0.05$ ). Co-occurrence of 82% carbon dioxide rise, 72% oxygen drop, 60% headache, and 100% moisture and temperature rise with the use of N95 mask has also been reported. This study concluded that an extended wearing of masks by the general population may lead to various health related hazards in many medical fields [9]. On the contrary, a study demonstrates a near-zero effect of wearing masks for the general adult population. This particular study measured the transcutaneous carbon dioxide tension and oxygen levels along with heart rate at the end of six 10-minute phases which included sitting quietly and brisk walking without a mask and with a mask. The study concluded that the risk of hampered gas exchange with surgical as well as cloth masks is near-zero. A point to note in this study is that the time of brisk walk was taken as 10 minutes. May this time be higher, the results would have been different [10].

Apart from the studies underlying physiological changes after using masks, one study elaborates an important aspect of the constituents used in the making of the facemasks. Phthalates (PAEs) are a group of chemicals used to make plastics more durable and may be a constituent of masks. These are also a known group of endocrine disruptors that can have adverse effects on human hormonal balance and development. Being semi-volatile in nature, these compounds can emit from the mask surfaces. As masks are coming in direct contact of the face skin and are covering the mouth and nose, PAEs emitted from the mask can enter the body of the subject and cause serious health related problems [11].

## Conclusion

In COVID times, the use of facemasks has been the subject of debate. Recommendations from various international agencies for the use of facemasks are conflicting across the world. Though the use of masks in the general public is a necessity to stop the viral transmission, its prolonged use has been found associated with different physiological alterations. Use of masks for longer times has

been found to drop the blood oxygen concentration which may lead to hypoxic conditions. Its prolonged use has also been found associated with headache, higher inspiratory carbon dioxide levels, hypercapnia, temperature and moisture rise and risk of infections. Thus, in the light of above facts, it can be concluded that use of masks should continue by the general public so as to reduce viral transmission provided they should be equipped more with the knowledge about the appropriate use of facemasks. A non-toxic mask worn in proper way and for an appropriate time (preferably for less than 4 hours continuously) and intermediate gap intervals accompanied by social distancing can go a long way in limiting COVID-19 pandemic. Further comprehensive studies are also recommended to reveal the facemask associated health risks.

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