



## "Mask Mouth'- A new malady affecting oral health in the COVID era."

Dr. Pooja Muley-Itke<sup>1\*</sup>

<sup>1</sup>M.D.S., Consultant, Oral physician and maxillofacial Radiologist, Aurangabad, Maharashtra, India. Mail IDpoojamuley.31@gmail.com. Orcid Id: 0000-0002-5258-5659  
\*Corresponding author.

Received: April 2021

Accepted: May 2021

### Abstract

**Background:** Presently the use face masks has become the need of the hour due to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic. Although the use face mask protects the user from SARS-CoV-2 infection, it has certain adverse effects. One of the new and recently noticed side effect is on the oral health of the wearer known as 'Mask Mouth'. This consist of symptoms like caries, gingivitis, halitosis, candidiasis and angular cheilitis. In this article, a systematic review was done, where comprehensive, critical and objective analysis of the current knowledge regarding adverse effects of using face mask on the oral health was reviewed. It was observed that prolonged use of mouth mask can cause dryness of mouth as well as bring about a change in the oral microflora and have an impact on overall oral health. Mask mouth can be prevented by maintaining proper oral and mask hygiene, avoiding mouth breathing and staying hydrated.

Keywords: COVID 19, SARS Cov 2, Mouth Mask, Oral Health, Adverse Effects

### Key Messages:

This article deals with a newly noticed phenomenon-mask mouth which is caused due to excessive and improper use of face mask in this COVID era. Very smaller amount of data is available currently on this topic. In this review article we have discussed this new occurrence and its implications.

### INTRODUCTION

The outbreak of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) pandemic has generated a global health crisis that has had a deep impact on the way we perceive our world and our everyday lives. The risk of severe infection with the virus depends profoundly on physical factors of the infected persons and the quality of the medical system. The routes of transmission of SARS-CoV-2 include direct transmission (droplet, e.g. cough, sneeze) and contact transmission (contact with oral, nasal, and

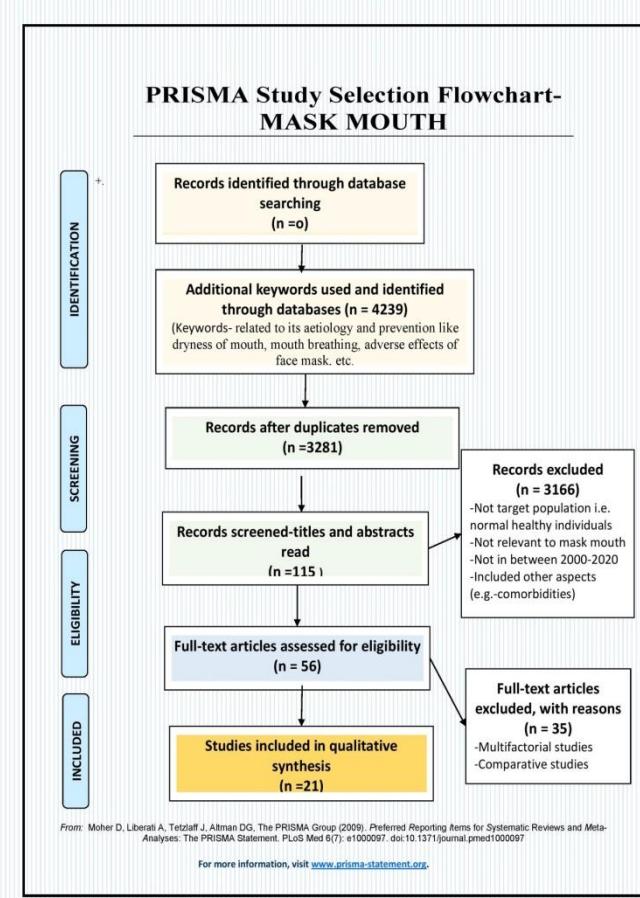
eye mucous membranes). The presence of SARS-CoV-2 in the environment of COVID-19 patients therefore reinforces the belief that fomites play a role in transmission of SARS-CoV-2; however, the relative importance of this route of transmission compared to direct exposure to respiratory droplets is still unclear. Thus wearing of face masks has become necessary and ubiquitous, not only in hospitals but also in the community.<sup>[1]</sup>

Even though the use face mask protects the user from SARS-CoV-2 infection, it has certain adverse effects like headaches, difficulty in communication, eye discomfort, breathlessness, impaired cognition, skin breakdown, acne. One of the new and recently noticed side effect is on the oral health of the wearer. A new term has been coined for this phenomenon - 'Mask Mouth'. Dentists all over the world have started to notice increase in patients with complaints of halitosis, gingivitis, ulcers and caries. It has been reported that there is inflammation in patient's gums that have been healthy forever, and caries in people who have never had them before. All these symptoms are being linked to the excessive and improper use of face mask. These are short term problems, but they may lead to severe ones if left unnoticed and untreated. In this article we will see this new phenomenon, its aetiology, its implications and prevention.

## MATERIALS AND METHODS

The current study is a systematic review, where comprehensive, critical and objective analysis of the current knowledge regarding adverse effects of using face mask on the oral health is reviewed. Articles were searched in online databases like PubMed, Science Direct, Springer link, DOAJ(Directory of Open Access Journals) and Google scholar were

used to find potentially eligible articles. Recent and updated articles were included. Since this is a very new topic (mask mouth), no scientific articles were found. Therefore articles related to its aetiology (dryness of mouth, mouth breathing, etc.), adverse effects of using face mask and its prevention were considered. PRISMA study selection flowchart is included to explain the process of article selection. (Figure 1)

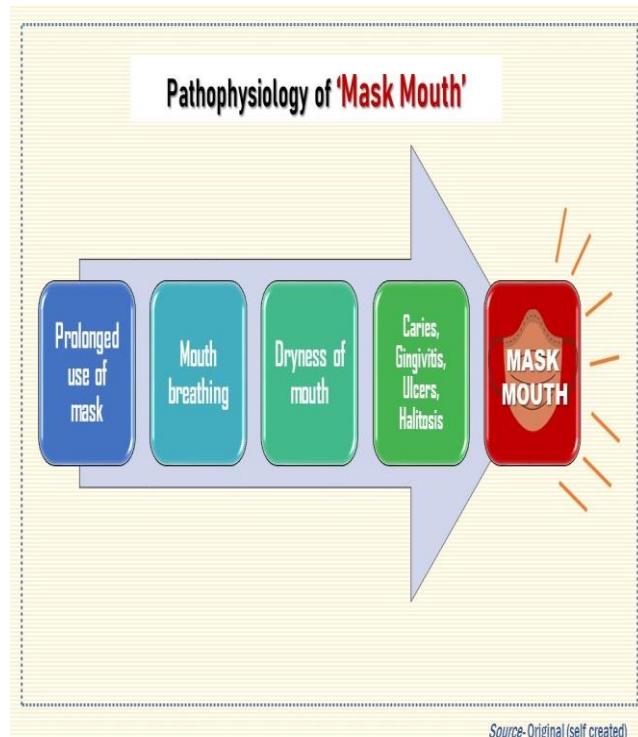


**Figure 1: PRISMA study selection flowchart**

## DISCUSSION

Mask mouth is triggered by covering mouth for longer periods of time which increases dryness of the mouth. Also there is an increased incidence of mouth breathing when using mask. Mouth breathing causes dryness of mouth and build-up of disease causing

microflora in the mouth. Moreover people's tendency to drink less water while masked up which has added to the widespread dehydration. Using unclean mask also add to the chances of infection. We know that mouth receives a greatest exposure to airflow during mouth breathing. Surface dehydration and reduced salivary flow occurs because of this and, subsequently, the gingival inflammation and irritation could be related to it.<sup>[2, 3]</sup> When salivary function is diminished, there is more risk of patient's developing caries, gingivitis, halitosis and having diseases such as candidiasis than there is in patients who have normal salivary flow rates (SFRs).<sup>[4]</sup> (Figure 2)



**Figure 2:** Pathophysiology of mask mouth

### Implications of 'Mask Mouth'

#### Dental Caries-

As we have seen using face mask causes increase in mouth breathing. Predisposition

to caries has been placed in correlation with the entry of air through the mouth and the regular intake of fermentable carbohydrates, resulting in the formation of plaque mostly composed of acid-forming and acid-tolerable species, such as Streptococcus mutans (*S. mutans*) and Lactobacilli.<sup>[5]</sup> A study by Mummolo, et al demonstrates that mouth breathing late adolescents and young adults have a higher risk to develop *S. mutans*, compared with the control subjects, and increase of plaque index in a period of 6 months. <sup>[6]</sup> Nascimento et al. reported that significantly higher number of initial lesions in all teeth was observed in the mouth breather group. <sup>[7]</sup> In another study it was observed that levels of Streptococcus mutans and Lactobacilli were higher in patients with hypo salivation. <sup>[8]</sup> These findings suggest that dryness of mouth and mouth breathing due to wearing face mask might be one of the factors related to the severity of dental caries.

#### Plaque Index

We know that dryness of mouth causes decrease in salivary rate and in turn causes increase in plaque formation. It was observed that the mouth breathing subjects seem to be predisposed to develop a higher plaque index (PI) compared with healthy subjects.<sup>[6]</sup> This result is in accordance with a previous case-control study performed on adults with asthma, in which a higher plaque score was found among the asthmatics subjects (mostly oral breathers) compared with control subjects.<sup>[9]</sup> A reduction of buffering capacity of saliva and its flow rate was also observed.<sup>[6]</sup> Hence we can say that using mouth mask can be a factor causing increase in PI and in turn leading to gingivitis and dental caries.

#### Gingivitis

Patients with chronic mouth breathing suffer from dry mouth which may result from

surface dehydration that eventually predispose to oral infection and progressive gingivitis.<sup>[10]</sup> Studies demonstrated that mouth breathing may cause an increase in susceptibility of gingival inflammation also indicate that whole mouth exhibits highly gingival inflammation not confined to anterior region in mouth breathing individuals.<sup>[7, 8]</sup>

### Halitosis

Most of the patients having mask mouth complain about halitosis, also known as 'mask breath'. We know that the posterior portion of the tongue's dorsum, where most malodour originates, is often covered by a layer of debris comprising cellular and non-cellular components and tongue coating plays an important role in increasing volatile sulphur compounds concentration in mouth.<sup>[11]</sup> An increase in severity of oral malodour in habitual mouth breathers was seen with a highly significant association. Oral dryness is the primary cause of oral malodour in such cases.<sup>[11]</sup> Decrease in salivary flow rate and decreased water intake increases its severity.

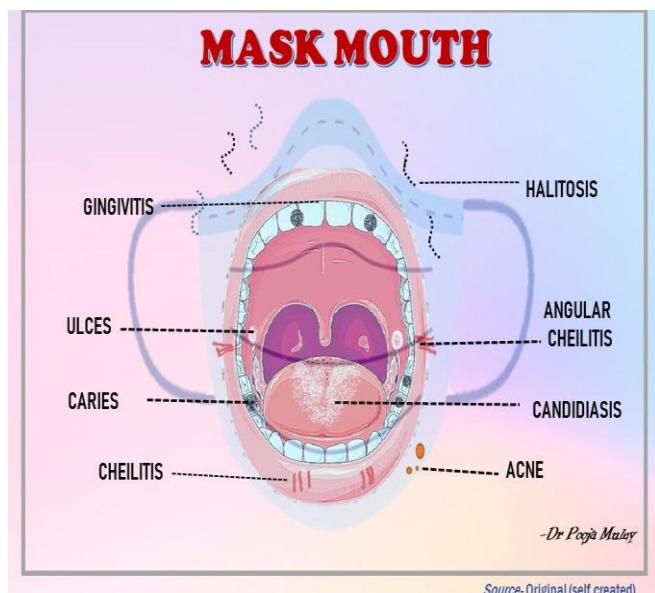
### Candidal Infection

Saliva plays a significant role in oral homeostasis. It contains antimicrobial proteins such as lysozyme, lactoperoxidase, immunoglobulins, histatins and lactoferrin. Histatins have potent antifungal activity and there is also some evidence that salivary IgA inhibits oral adhesion of *Candida albicans*.<sup>[12]</sup> Oral dehydration due to use of mask, may alter the oral microbiota and increase the risk for opportunistic infections, such as candidiasis. Dry mouth and decreased salivary rate can be a predisposing factor of developing candidal infection. According to a study conducted by Nadig et al, it was found that there is statistically significant

association was observed between reduced SFRs and increased *Candida* counts.<sup>[13]</sup>

### Angular Cheilitis and Ulcers

Prolonged use of face mask creates a warm moist environment on surrounding skin of mouth which is a perfect condition for bacteria to flourish and grow. This overgrowth of bacteria can produce angular cheilitis, cracking and ulcers at the corner of the mouth. (Figure 3)



**Figure 3:** Pictorial representation of implications of mask mouth

### **Prevention of 'Mask Mouth':**

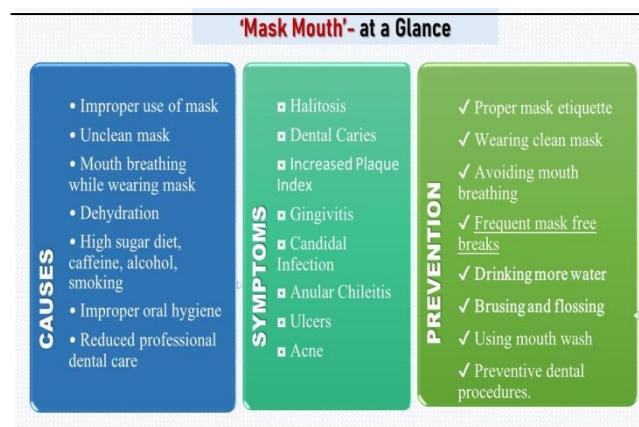
Wearing a face mask while stepping out has become a norm and an inevitable part of our lives. In today's times the benefits of wearing masks outweigh the adverse effects. Likewise the adverse effects can be easily prevented by following certain principles like -

- ✓ Mask etiquette
  1. Use proper technique to wear mask. Wearing clean mask, if possible changing mask every 6 hours (if using cloth mask).
  2. Avoiding mouth breathing while wearing mask. Health experts

- encourage to breathe in through their nose and exhale through their mouth. The mouth is better for exhaling and allows the body to expel air more efficiently.
3. Limiting circumstances: Use of facemasks should be restricted to higher risk circumstances, including crowded, indoor spaces, where physical distancing is not possible, e.g. public transport
  4. Frequent mask-free work breaks to be incorporated into work shifts to allow for shorter duration of mask use and reduction of PPE exposure.<sup>[15,16]</sup>
  5. Use of improved mask design with a focus on safety, comfort, and tolerability.<sup>[16]</sup>
- ✓ **Preventative measures** such as applying moisturizers, emollients, and barrier creams to prevent skin breakdown.<sup>[17]</sup> Caution should be taken that dressings, moisturizers, and lotions do not interfere with the seal of the mask thereby causing decreased protection against COVID-19 particles. Prevention of headaches and impaired cognition by frequent short breaks, neck massage, increased hydration especially before start of the shift, alternating between surgical and N95 masks (if possible) and wearing a mask that fits one's face best is recommended.<sup>[18]</sup>
- ✓ **Drinking more water throughout the day-** Frequent consumption of water helps to stimulate saliva production, reduce chances of dry mouth and help in caries prevention.<sup>[19]</sup>
- ✓ **Oral hygiene practices**
1. Patients should brush their teeth carefully 2 or 3 times a day with either a manual toothbrush or an

electric toothbrush brush including tongue and the sides of cheeks.

2. Use of mouthwashes at least once a day is recommended. Patients with dry mouth problems should avoid mouth rinses containing high concentration of detergent components which reduce the substantively of the agent and worsen the dry mouth effect. Using chlorhexidine mouthwash highly clinically significant for prevention of caries and plaque formation.<sup>[20]</sup>
  3. Flossing twice a day is recommended.
- ✓ **Dental procedures**- Preventive fluoride application,<sup>[11]</sup> prescribing 10% chlorhexidine varnish,<sup>[21]</sup> scaling, pit and fissure sealants can help in preventing mouth mask.
- ✓ **Avoiding-High sugar diet, overconsumption of caffeine, alcohol and smoking.**
- ✓ **Patient awareness-** Last but not the least making the patients aware about the 'mask mouth' is very essential to prevent its implications. (Figure 4)



**Figure 4:** Mask Mouth at a glance

## CONCLUSION

The situation of the current COVID-19 pandemic is very different from that of the "parachutes for leaping out of aeroplanes", in which the aspects of harm and prevention are easy to define. It is necessary to study the complex interactions that may be working between positive and negative effects of wearing mouth masks. Definitely the positive aspects of wearing a mouth mask prevail over the adverse effects and its use cannot be

avoided in current times. A positive aspect about the mouth mask is that it can be easily prevented and treated. So it is the need of the hour to act fast and save the population from the long term effects of 'Mask Mouth'! But presently there is insufficient data to quantify all of the adverse effects that might reduce the acceptability, adherence, and effectiveness of face masks. Urgent research is also needed on various other symptoms and implication of mouth mask.

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Source of Support:Nil,Conflict of Interest: None declared