



# MASKNE: Mask-Induced Acne Flare During Coronavirus Disease-19. What is it and How to Manage it?

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## Abstract

The coronavirus disease (COVID)-19 is a global pandemic caused by severe acute respiratory syndrome (SARS)-CoV-2. Due to the rapid spread of the disease, several measures have been proposed to mitigate its transmission, including wearing a mask in certain circumstances. This new proposition leads to some novel skin adverse effects; one of them is acne flare. This particular outbreak has significantly affected people's quality of life. In this minireview, a brief current knowledge of SARS-CoV-2 and its related-acne-flare, or popularly called as mask-acne (MASKNE), are discussed. This review aims to provide some information that may be helpful in opting for the most suitable management and treatment for each individual.

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## Introduction

Coronavirus disease (COVID)-19 is a disease caused by SARS-CoV-2. It was first discovered in late December 2019, in Wuhan, China [1]. The World Health Organization (WHO) later declared it as a pandemic due to its rapid spreading [2]. The outbreak of COVID-19 has affected many facets of life globally, including personal habits and lifestyle. It is implored by the Center for Disease Control and Prevention and WHO for people to take preventive measures in mitigating the spread, including covering mouth and nose with a mask when around others [3], [4]. This new arrangement has a distinct impact on daily life. Individuals are wearing masks more often and longer than before, especially health workers who are working at a higher risk of transmission environment. Thus, it leads to a local acne outbreak in the area covered by the mask, which is popularly called as "maskne or mask acne." This phenomenon is supported by accumulating data about adverse effects on the skin against personal protective equipment (PPE), including mask. A study discovered that 59.6% of individuals wearing mask regularly have experienced acne outbreak [5]. This finding is supported by several literature resources highlighting this phenomenon [6], [7], [8].

Many have agreed that acne may affect many aspects of an individual's life. A study asserts that acne

impacts greatly in one's psychological state; persons with acne are often at greater risk of lowered quality of life [9]. A cohort study also shows that adolescents and adults suffering from acne have higher rates of anxiety, low self-esteem, and depression compared to individuals without acne [10]. Therefore, this rising undesirable phenomenon should be addressed and mitigated properly since the pandemic is still continuing to allow individuals to have a decent quality of life.

## COVID-19

### A brief review

SARS-CoV-2 is a  $\beta$ -coronavirus (CoV), which primarily targets the respiratory tract [11]. It is an enveloped virus with a single positive-sense stranded RNA genome [12]. The CoV has 4 genera ( $\alpha$ ,  $\beta$ ,  $\delta$ , and  $\gamma$ ). However, it is identified that only  $\alpha$  and  $\beta$  can infect mammals, while  $\delta$  and  $\gamma$  can infect birds [13]. The origin of SARS-CoV-2 has remained elusive, but it is found that its genome sequence is identical to a bat CoV RaTG13 (96.2%), while it is also shared 79.5% similarity to SARS-CoV-2. Thus, it is postulated that the natural host of the originate virus is bat, with an unknown intermediate host [13].

## Route of Transmission

Due to its nature, it is believed that person-to-person transmission is plausible through inhaled respiratory microdroplets spread by coughing or sneezing from an infected person or carrier [14]. However, the exact route of transmission is still elusive. Several findings show that it may also be transmitted through the mucous membrane of the eyes, and it is also proposed that transmission through gastrointestinal tract is plausible [14], [15], [16].

The understanding of the basic reproduction number is imperative in managing the transmissibility. The R nought ( $R_0$ ) can be defined as the ability of the pathogen to produce a secondary infection through an infected person. The  $R_0$  of SARS-CoV 2 is estimated in a range of 1.46–6.49, with a mean of 3.28 [17], which means that COVID-19 is considered contagious.

## Pathogenesis

It is discovered that angiotensin-converting enzyme 2, which can be found in the lower respiratory tract, acts as a receptor for SARS-CoV-2. The envelope spike S glycoprotein will bind and initiates membrane fusion into the host cell [12], [13]. After successfully fused, the viral genome RNA is then released into the cytoplasm, and the uncoated RNA encodes non-structural protein to form a replication-transcription complex (RCT). The RCT then synthesis a new set of subgenomic RNA which plays a major role in encoding the necessary accessory and structural proteins to form a new virus [12]. When the virus enters the cells, its antigen will be presented to the antigen presentation cell of the host. This event will induce the immune response of the body.

## Clinical Manifestation

The clinical characteristic of COVID-19 varies from mild-to-severe. The main symptoms are usually fever (98%), dry cough (76%), myalgia, or fatigue (44%) [18]. Other less common manifestations include nasal congestion, headache, runny nose, sore throat, vomiting, and diarrhea. In severe condition, hypoxemia and dyspnea are often found, leading to acute respiratory distress, difficult-to-manage metabolic acidosis, and coagulation, which may lead to fatality [14], [18], [19]. It is noteworthy that some individuals may spread the virus while being asymptomatic. Therefore, it is essential to follow the recommended preventive measures such as

practicing hand hygiene, wearing a mask, and limiting social gatherings [3].

## Acne

### Pathogenesis

Acne is a multifactorial pilosebaceous inflammatory disease. It is very common and most often seen in adolescents [20], [21]. Even though the exact pathogenesis of acne has not been fully elucidated, there are four essential facets that have been widely adopted in its pathogenesis. First is the hyperproliferation of follicular epithelial cells, leading to follicular plugging, excess sebum, inflammation, and the role of *Propionibacterium acne* or recently is called as *Cutibacterium acnes* (*C. acnes*) [20], [22], [23], [24].

Hormones and immune responses are believed to have a distinct role in each phase.

Initially, the infundibulum part of a hair follicle is packed with an abundant number of keratinous cells and highly cohesive keratinocytes resulting in microcomedone. It is believed that the formation of microcomedone is also influenced by the decreased level of linoleic acid and increased *C. acnes* metabolism [23], [24]. It is also proposed that an elevated level of androgen and increased activity of interleukin 1 plays a role in the overproduction of the sebum [22], [23]. When the excess sebum is trapped in the follicle with the keratinous squamae, a thin wall cystic lesion (comedone) is formed. The overgrowth of *C. acnes* and excess sebum as its nutrient emulates a bigger formation of the previous lesion (papule or nodule). Finally, the mixture of keratin, hair, and sebum provokes a non-immune foreign body inflammation process [23], [24].

## Acne and Mask

During this pandemic, one of many means of mitigating the spread of the virus is wearing a mask. In June 2020, the WHO also updated its guidance, stating that individuals and healthcare workers should wear a mask in appropriate settings and environments [2]. This guidance leads to a fact that many people wearing mask in a longer period. Acne flare due to prolonged mask-wearing has been reported lately in both general and healthcare populations. Several case reports and literature have been addressed to discuss and manage the undesirable effects of the prolong-use of PPE, including mask-related acne outbreak [5], [7], [8], [25].

The lesions are mostly found in the local area covered by the mask, and the severity varies

from mild-to-severe in each literature [6], [7], [8]. It is proposed that the possible factor of this particular localized outbreak is the increased humidity and temperature in the covered area. It is known that high temperature can affect the rate of sebum secretion. It is also postulated that increased humidity might increase the amount of squalene in the skin [26]. In addition, studies have discovered that increased humidity and excess sweating lead to swelling of the epidermal keratinocytes [27]. All these alterations lead to acute obstruction and acne aggravation [26] (Figure 1).



Figure 1: MASKNE. Adapted from <https://www.marketwatch.com/story/maskne-yes-mask-acne-is-now-a-thing-2020-06-26>

These hypotheses are also supported by a case study of tropical acne. It is known that hot and humid environment has a significant correlation with acne flares [28]. However, it is concluded that the exact pathogenesis of acne flare due to mask-wearing remains a puzzle.

It is noteworthy that not only may prolonged mask-wearing affect acne outbreak but it also might increase the temptation of touching the face due to annoying acne or itch, which may increase the risk of COVID-19 transmission through the respiratory tract [29].

## Recommendation and Prevention

The duration of this pandemic is still uncertain, with a probability of an upcoming of second wave in most continents. Thus, suggestions and recommendations in enduring the effects of long-term mask-wearing are crucial for the sake of the health and comfort of each individual, especially for healthcare workers, who need to wear both regular and medical masks most of the time.

There are several preventive measures that might be implemented. Frequent break time of wearing mask is highly recommended to shorten the duration and exposure of the mask [30]. It is also recommended to replace the surgical mask and N95 mask routinely. Han *et al.* [7] suggest that mask should be replaced

after 4 h for surgical mask and 3 days for N95 mask, while Desai *et al.* [31] recommend to take a 15-min break after 2 h of wearing mask. Preventative measures such as applying oil-controlling moisturizer (i.e., with licochalcone A as one of the ingredients) or dressing application before wearing a mask is also suggested to decrease sebum secretion [7], [32], [33]. However, it is also implored to always reassure that those vehicles do not interfere with the mask seal, allowing less protection against the virus. A literature source also asserts the importance of an improved mask design focused on safety, comfort, and tolerability [34]. American Academy of Dermatology Association also suggests avoiding new skincare that might irritate skin or increase the use of strong products such as retinoid, chemical peeling agents, and exfoliant [35].

Another literature source also suggests a general approach to control the acne outbreak. First is to wash the face twice daily with warm water and opt for an appropriate cleanser; a strong alkaline soap is not recommended. A study also stresses the importance to do this routine before wearing the mask [31]. Second, it is advisable to wear no cosmetic or light cosmetic only. Finally, mild lesions can be treated with topical antibiotic or retinoid, while severe condition might be treated with systemic minocycline or isotretinoin [36].

Although there are some inevitable adverse effects in the prolonged use of mask, wearing mask properly is one of many essential approaches in protecting ourselves and others. The abovementioned suggestions aim to hinder and alleviate the undesirable effects and maintain compliance.

## Limitation and Conclusion

There are some limitations of this review, including the lack of robust data and variation of the duration of wearing the mask. Due to the complexity of acne pathogenesis, there are some gaps in the literature sources that have been reviewed since most of the sources do not consider other risk factors, such as body mass index, skin type, and hormonal imbalance. In addition, further information about the material of the mask has not been included yet in most literature, this may contribute to a mistaken diagnosis of contact dermatitis eruption. Most of the literature reviews published are either case reports or clinical reviews. Thus, a thorough study is needed to elucidate and manage this issue. To conclude, in this era of the pandemic, assuring the safety of ourselves and others by wearing proper PPE is of paramount importance. However, occupationally induced skin condition (in this case, due to PPE) cannot be neglected and must be minimized.

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