



Facial Dermatoses in the Age of Masks: Acne, Eczema and the New Maskne.

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ABSTRACT

The COVID-19 pandemic necessitated the widespread use of personal protective equipment, particularly face masks, as a key public health intervention. Although effective in mitigating viral transmission, prolonged mask usage has been associated with a growing incidence of facial skin conditions. These include maskne, irritant and allergic contact dermatitis, rosacea, seborrheic dermatitis and perioral dermatitis which have all been observed with higher frequency since the onset of the pandemic. They arise due to factors such as friction, pressure, heat, occlusion, sweat retention, disruption of the skin microbiome and exposure to chemical irritants found in mask materials. This review explores the pathophysiology, clinical manifestation, risk factors and psychosocial implications of mask-induced facial dermatoses, particularly a focus on women and young people where these conditions are influenced by psychological stress, chronic mask use and chemical sensitization. Prevention and management strategies focus on adopting mild skincare routines, employing lipid-rich moisturizers, selecting breathable or biofunctional mask materials and ensuring rigorous mask hygiene. Therapeutic approaches include plant based anti-inflammatory substances, topical and systemic medications for rosacea and acne and barrier repair-approaches. Future directions also include the development of gentle and antibacterial mask materials and the development of teledermatology services.

KEYWORDS: “Maskne” “Contact dermatitis” “COVID-19” “Acne mechanica” “Facial dermatoses” “Skin microbiome” “Rosacea” “Teledermatology”

INTRODUCTION

The outbreak of covid-19 pandemic has led to a global panic and various approaches have been implemented to prevent the transmission of the disease. Among these, the usage of personal protective equipment (PPE) i.e like masks, has been highly debated if it could prevent the spread. However, several studies have shown that usage of masks has been a beneficial strategy in preventing the spread of Covid-19, especially in healthcare and welfare workers and countries with higher population density [1, 2]. Nonetheless, this prolonged practice of wearing masks has led to development of new dermatological conditions to combat. “Maskne” refers to the development of new or exacerbation of pre-existing acne lesions confined to the areas covered by masks [3]. The recent boost in the prevalence of dermatological conditions such as acne, rosacea, seborrheic dermatitis, and contact dermatitis in relation to prolonged usage of masks also presents as a serious concern. A cross-sectional study conducted in Korea from July to August 2021 has reported that 75.9% of study participants out of 1,958 facial dermatoses cases had de-novo formation or exacerbation of pre-existing skin conditions. This study comprises data from both general public and healthcare workers [4]. Another cross-sectional study conducted in Georgia has revealed that medical students had experienced worsening or a new outbreak of acne or rosacea since they started wearing masks [5]. Individuals who are dealing with facial dermatoses often experience low self-esteem and this claim has been reinforced by studies which analyzed the psychological relation between visible facial lesions and mental health [5, 6]. Addressing these conditions is essential as it affects the personal and social life of patients. Patients, especially medical students often turn to self-medication due to this social stigma [7]. This review aims to consolidate current evidence on mask-induced facial dermatoses focusing on acne, eczema and Maskne and to propose evidence-based strategies for their prevention and management.

METHODOLOGY: A comprehensive literature review was conducted using PubMed, Scopus and Google Scholar. Articles published between 2018 and 2025 were included. Keywords such as “maskne”, “mask-induced acne”, “facial dermatitis” and “contact dermatitis” were used. Studies were selected based on relevance to the epidemiology, pathogenesis and management of facial dermatoses associated with mask usage.

DISCUSSION

1. Pathogenesis

1.1 Dermatoses associated with changes in skin biome : The skin and its microbial biome act as a protective barrier against foreign objects. As this microbiome is disturbed due to prolonged mask usage, a substantial increase in bacterial load has been observed, which is referred to as “Dysbiosis” [8, 9]. Multiple studies have demonstrated the positive correlation with acne and high humidity. Prolonged usage of masks leads to a hot and humid microenvironment suitable for bacterial growth leading to escalated sebum synthesis, and occluded pores. This promotes inflammation and exacerbates previous

acne or induces de-novo acne formation. These changes along with dysbiosis contribute to the pathogenesis of maskne [10, 11].

1.2 Dermatoses associated with sweat and humidity : Wearing face masks for extended duration can cause mechanical damage to the skin, mainly due to sustained pressure, which leads to decreased regional blood flow and causes an ischemic effect. This damage results from a combined effect of ischemia and a humid microenvironment beneath the mask. This results in inhibition of the normal function of the stratum corneum and facilitates the exacerbation of atopic eczema. Friction caused by the mask can induce erythema [11, 12]. Additionally, the moist and humid microenvironment promotes sebum and sweat secretion. This induces hyperplasia of keratinocytes. Swollen keratinocytes along with sweat and sebum, leads to obstruction of pores, which aggravates acne. Long-term usage of masks prevents evaporation of sweat, resulting in accumulation and irritation of the skin, especially in individuals with sweat allergy. Furthermore, sweat aggravates atopic dermatitis as it triggers a type-1 hypersensitivity reaction overseen by IgE [12,13,14].

1.3 Dermatoses associated with chemical compounds present in masks : Chemicals and dyes used to manufacture fabric masks cause allergic reactions and promote the development of contact dermatitis. Synthetic chemicals such as formaldehyde, thiuram, dibromodicyanobutane cause a delayed type IV hypersensitive reaction. This causes allergic contact dermatitis (ACD). Reports of few carcinogenic (benzothiazole) materials which are used in the textile industry to manufacture masks are shown to enter systemic circulation [12,13].

2. Acneiform Eruptions: Maskne

Maskne or mask-induced acne, is a subtype of acne mechanica that has become more prevalent since the COVID-19 pandemic. The use of PPE, including face masks, face shields and goggles, by healthcare workers, students and others has predisposed the development of new acne lesions or exacerbation of previous acne, primarily triggered by friction, occlusion and microenvironmental changes under the mask [10]. Acne lesions typically develop within 6 weeks of regular face mask use and most commonly affect the 'O-zone' of the face, which includes the nose, mouth, cheeks, and chin, and are different from other skin conditions such as dermatitis and eczema [15]. Clinically, maskne is associated with different types of lesions. One such lesion is the formation of red bumps, known as papules that may be itchy and painful to touch. Additionally, closed comedone commonly known as whiteheads and blackheads may develop. These clogged pores typically do not cause irritation but can contribute to the overall appearance of acne [16]. Maskne can also lead to the formation of pustules, pus-containing pimples and occasional nodules, deep and severe forms of acne which the overgrowth of bacteria can cause due to the microenvironmental change under the mask [15,16].

Dermatologists have been diagnosing more skin conditions related to maskne stemming from the COVID-19 pandemic in 2020. To determine the incidence of maskne and which healthcare personnel were most vulnerable to it, an online research was carried out. Hospital employees at the Lebanese

American University Healthcare Center, including nurses, doctors, medical students, pharmacists, and dietitians, participated in the study. The results of a six-month study conducted using Google forms between December 2021 and June 2022 revealed that 81 out of 201 subjects (40.2%) reported maskne following the COVID-19 pandemic. Of these, 51 participants (62.9%) had a new onset of maskne and 30 participants (37.1%) had aggravated acne following the COVID-19 pandemic. The new onset of acne was said to be mild in most cases (90.1%) [17]. Another study targeting medical students in their clinical years was conducted between February 2022 and April 2022 at Georgian medical universities during the COVID-19 pandemic. Using an online survey of 151 participants, the study found that 76 individuals (51.4%) reported new or worsening acne since the pandemic began. The most common lesion types identified were closed comedones, pustules and papules [5]. Beyond physical symptoms, maskne has negatively impacted emotional well-being. Especially among adolescents, such as medical students, it has affected the psychosocial aspect of individuals, causing decreased self-esteem, social anxiety and depressive episodes [18]. It is important to diagnose and treat these dermatological conditions to prevent worsening or chronic cases of facial maskne.

3. Irritant And Allergic Contact Dermatitis

Since the COVID-19 pandemic, public health protocols have changed significantly leading to a rise in dermatological conditions, particularly those related to mask use. The disruption of the normal skin microbiome plays a crucial role in the development of these dermatological issues [13]. ACD, a delayed type hypersensitivity reaction that takes place in 2 steps: first, the body gets sensitized to certain substances when it comes to skin contact, and reacts whenever the body is exposed to them again. During the first stage, the skin's immune system picks them up and sends them to the lymph nodes, where they learn to recognize those substances. This leads to the second stage, which is elicitation characterized by inflammation, itching, and redness due to the release of chemicals such as the interferons. On the other hand, irritant contact dermatitis (ICD) is caused by direct exposure to chemical irritants, which is not mediated by the immune system and occurs without prior sensitization. Masks can cause ICD due to friction, pressure, and moisture buildup, especially in people wearing them for long hours [19, 20].

Certain materials found in the masks, like polyurethane sponge strips, diisocyanates, and formaldehyde, are known to cause ACD and ICD. Tightly fitted masks like FFP2 and N95 can worsen these conditions by trapping moisture causing low permeability and constant friction [21]. Prolonged use of fabric masks also increases skin temperature and traps sweat, especially in persons with facial hyperhidrosis creating a humid microenvironment that promotes skin irritation and inflammation [13]. Other allergic substances that play a role in the development of contact dermatitis include rubber accelerators involved in the vulcanization process during the manufacturing of masks, and are present on the elastic components of the masks such as Benzothiazole, guanidine, dithiocarbamate, and thiuram are the most frequently identified sensitizers. Antioxidants like phenylenediamine derivatives are also strongly recognized for their strong allergic potential. All of these agents are related to the development of ACD, while exposure to natural rubber latex leads to the development of type 1 hypersensitivity reactions

[22]. Among health care workers, mask usage is associated with the development of ICD, clinically manifested as erythema, scaling, fissures and edema at sites where mask contact is mostly present, such as the cheeks and nasal bridge [23]. Especially in sensitized people who have previously been exposed to plants that contain urushiol, uncommon plant-derived allergens, such as those in fruits like mango may cause facial allergic reactions [24]. A study conducted by Neisert et al in Germany involved 550 participants from both healthcare and non-healthcare backgrounds. Individuals with facial skin symptoms due to face mask use showed a greater tendency to exhibit type IV hypersensitivity reactions, which showed a strong correlation with the development of allergic contact dermatitis [25]. Unfortunately, preventive measures such as mask usage can result in skin conditions, highlighting the need for greater awareness and preventive skincare [26, 27].

4. Other Facial Dermatoses Exacerbated or Induced by Mask Usage

With the increased usage of masks during and after the covid 19 pandemic, there has been a considerable jump in facial dermatoses, especially among individuals with already existing skin conditions [28].

4.1 Mask use and Rosacea: Rosacea is a skin condition predominantly affecting the forehead, nose, eyes and cheeks with its hallmark features being frequent flushing, phymatous changes, chronic erythema, pustules and papules. This condition notably affects both self-esteem and overall quality of life [29]. A prospective study conducted during the pandemic with patients pre-diagnosed with mild to moderate papulopustular rosacea exhibited a relapse in their condition post pandemic. This relapse in condition can be associated with increased duration of mask usage [30]. Masks can change the microenvironment of the skin by increasing sebum production, raising pH levels and dehydration. Sebum imbalance and dehydration can cause *Propionibacterium acne* which can result in inflammatory lesions including papules and pustules as well as innate immunological responses. Rosacea can occur as a result of *Demodex folliculorum* colonization caused by elevated inflammatory skin lesions and sebum [31].

4.2 Seborrheic Dermatitis : It is identified by flaky, erythematous and greasy plaques, generally affecting the face, scalp, chest and groin. It is often associated with pruritus [32]. Based on a study from Milan, it showed worsening of seborrheic dermatitis symptoms in patients post lockdown. These symptoms were in individuals reportedly wearing masks for 6 to 10 hours daily [33]. Another multicenter study involving patients with seborrheic dermatitis used SSSD and SEDASI scores to assess severity. After one month, Regardless of the type of mask, both indices showed a significant increase confirming that continuous face occlusion exacerbates seborrheic dermatitis symptoms [34].

4.3 Perioral Dermatitis : Perioral dermatitis (POD) presents as papular, pustular or vesicular eruptions, often caused by topical corticosteroids, cosmetics or fluoridated toothpaste. Based on a Milan study, POD was found solely in the skin beneath the masks. Face masks increase the facial temperature, which leads to changes in the microbiota (growth of *Staphylococcus epidermidis*, *Demodex folliculorum* or *Fusobacteria* species) and the skin barrier permeability. In summary, POD is another type of facial

dermatitis that, like seborrheic dermatitis and rosacea can be exacerbated by using anti-COVID-19 face masks [35].

5. Risk Factors and Vulnerable Groups

The prevalence of maskne and other mask-induced facial dermatoses has been notably higher in certain populations and age groups. Healthcare workers are a high-risk, vulnerable group due to prolonged use of face masks and are mainly predisposed to maskne or skin conditions such as eczema and dermatitis. A web-based questionnaire showed that 40.2% of healthcare workers developed maskne, and 62.9% had a new onset of maskne. Those highly associated were those with long-hour shifts of >8 hours and females <30 years of age [17]. Maskne is more prevalent in females and young individuals between 21 and 30 years of age, and this may be due to hormonal fluctuations, stress, or even due to skin sensitivity. Individuals with a previous history of acne or sensitive skin can also be more prone to maskne. A cross-sectional study was conducted in Nigeria, and findings showed that the male-to-female ratio was 1:1.41, and people with a history of acne presented with new or worsening acne [36]. Another study proved that stress was the most common factor predisposing to maskne, followed by those with a high high-glucose diet and hot weather [37]. Long-term mask use, psychological stress, and the pandemic itself have all been linked in studies to stress-related skin and hair disorders such as telogen effluvium and acne flare-ups [38]. An online questionnaire study in China, which was taken amongst healthcare personnel, found that those with inflammatory facial dermatoses (IFD) and allergic skin were grouped to be more likely to present with maskne. The change in microenvironment within the mask to the skin could be the leading cause of maskne development. Furthermore, the study revealed that those wearing N95 masks were more prone than those wearing surgical masks. This could be due to the tightness of the mask creating low air mobility and higher pressure within the mask [39].

6. Prevention and Management Strategies

Maskne is primarily driven by a multifactorial process such as mechanical friction, occlusion, and disruption of the skin's microbiome. Accordingly, effective management and prevention of maskne are required which is achieved through an integrated approach that includes evidence-based skincare practices, scientifically guided mask design and continued adherence to public health protocols [15].

6.1 Skincare routine changes for prevention: A consistent skincare routine is the key to minimizing dermatological conditions caused by prolonged mask usage. Initiating the skincare regimen with a gentle, soap-free cleanser followed by the application of a light emollient 30 minutes before donning the protective equipment is advised [12]. To help prevent contact dermatitis moisturizers that are rich in lipids are useful and can keep the skin barrier strong and hydrated. Moisturizers that contain hydrating agents like hyaluronic acid or polyglutamic acid are found to be effective without causing any irritation. In contrast, the use of occlusive ingredients like minerals and petroleum can retain moisture inside the mask, potentially worsening acne. Mechanical irritation and manual extraction of acne must be avoided, and when it comes to people with excessive sweating, it is preferred to use

powder-based products, which contain zinc oxide, in their skincare routine. It helps to absorb moisture, and it decreases skin congestion. Treatment of contact dermatitis involves moisturizers containing urea and plant-based oils, which help calm irritation and support recovery [10, 40]. A RCT conducted by Wang L et al et in 54 patients highlighted the benefits of *Centella asiatica* noting its anti-inflammatory and skin-repairing effects, have been shown to reduce redness, dryness and skin sensitivity. In particular, the Dr. Yu *Centella asiatica* mask, when used along with standard therapy, showed effective management of rosacea by strengthening the skin barrier [41]. A highly water-soluble form of rutin showed rapid anti-inflammatory and healing effects and improved mask-induced skin conditions within 24 hours after the application. It significantly reduced hyperpigmentation by altering the levels of melanin, which was observed after 4 days of treatment [42].

6.2 Mask material and Hygiene: Mask material also plays a critical role in skin health. UPF 50 + fabrics provide sun protection and are tightly woven- high thread count fabrics minimize friction. Cotton masks are gentler and are washable, but they tend to become sticky by retaining moisture. Conversely, because synthetic biofunctional fabrics have enhanced evaporation and cooling capabilities, they remain drier. Maintaining adequate hydration and practicing good oral hygiene, including twice daily brushing and daily flossing, supports overall skin and mucosal health [12]. Mask-free breaks can alleviate skin irritation, but are often impractical for frontline workers; hence, strict adherence is essential to prevent dermatological complications. Surgical masks must be cleaned every 4 hours, and N95 masks every 3 days [3].

6.3 Treatment Strategies: The treatment of mild maskne includes topical antibiotics, benzoyl peroxide or retinoids, while moderate to severe maskne requires oral antibiotics combined with retinoids. Caution is necessary as these agents can induce occlusion and aggravate lesions. Plant-derived compounds with anti-inflammatory, sebum-regulating and antimicrobial properties are considered safer alternatives [3]. Accurate diagnosis and differentiation from other skin conditions are essential for its management. Consistent skin care routines, combined with proper mask hygiene and avoidance of skin irritation are key to minimizing mask-related breakouts and maintaining skin health [41].

7. Future Directions:

Widespread use of masks have been connected to numerous facial dermatoses as prolonged mask use causes increased moisture retention and penetration of allergens and irritants exacerbating facial complaints [10, 43]. The materials used to make these masks also play a significant role in maskne. Polypropylene is the most commonly used material to make surgical masks. A number of skin conditions can be caused when there is a direct contact between polypropylene and the skin. Innovation in the materials used to create masks can thereby lessen the incidence of face dermatoses and their exacerbations, even if the period of mask use cannot be decreased. Synthetic fabrics with antimicrobial properties and the ability to reduce moisture retention should be the focus of future research to avoid facial dermatoses [12, 44]. The rapidly growing field of teledermatology, which uses telecommunications technologies to offer medical information and services, is another area that needs

attention in order to prevent maskne. Cost-effectiveness, waiting list reduction, and continuity of care have all been proven via teledermatology, particularly in rural locations. With further recommendations, teledermatology can significantly contribute to the decrease in facial dermatoses caused by maskne. Emerging materials like biofunctional fabrics and topical treatments like *Centella asiatica* masks exhibit potential, even though they lack extensive data. To prove the effectiveness, safety and cost-efficiency of these therapies, extensive randomized controlled studies are required [45, 46].

Conclusion:

The COVID-19 pandemic has drawn attention to the unanticipated dermatological consequences of prolonged mask use. Acne, rosacea, eczema and contact dermatitis are among the facial dermatoses that have become much more common, affecting not just skin health but also mental well-being. The prevalence of maskne and other mask-induced facial dermatoses has been notably higher in certain populations and age particularly healthcare employees and those with sensitive skin, so identifying risk factors is crucial. Effective management and prevention of maskne require evidence-based skincare practices, scientifically guided mask design and public . In order to manage these dermatoses, more access to teledermatology and further research will be essential. Addressing the changing dermatological issues in the post-pandemic age requires a proactive, evidence-based strategy.

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რეზიუმე

COVID-19 პანდემიამ საზოგადოებრივი ჯანდაცვის ძირითად ჩარევად პირადი დამცავი აღჭურვილობის, განსაკუთრებით სახის ნიღბის ფართოდ გამოყენება მოითხოვა. მიუხედავად იმისა, რომ ნიღბის ხანგრძლივი გამოყენება ვირუსული გადაცემის შემცირების ეფექტური საშუალებაა, ის სახის კანის დაავადებების მზარდ შემთხვევებს უკავშირდება. ესენია: ნიღბის ტარება, გამაღიზიანებელი და ალერგიული კონტაქტური დერმატიტი, როზაცეა, სეზონური დერმატიტი და პერიორალური დერმატიტი, რომლებიც პანდემიის დაწყებიდან უფრო ხშირად შეინიშნება. ისინი გამოწვეულია ისეთი ფაქტორებით, როგორიცაა ხახუნი, წნევა, სიცხე, ოკლუზია, ოფლის შეკავება, კანის მიკრობიომის დარღვევა და ნიღბის მასალებში არსებული ქიმიური გამაღიზიანებლების ზემოქმედება. ეს მიმოხილვა იკვლევს ნიღბით გამოწვეული სახის დერმატოზების პათოფიზიოლოგიას, კლინიკურ გამოვლინებას, რისკ-ფაქტორებს და ფსიქოსოციალურ შედეგებს, განსაკუთრებით ქალებსა და ახალგაზრდებს, სადაც ამ მდგომარეობებზე გავლენას ახდენს ფსიქოლოგიური სტრესი, ქრონიკული ნიღბის გამოყენება და ქიმიური სენსიტიზაცია. პრევენციისა და მართვის სტრატეგიები ფოკუსირებულია კანის მოვლის ნაზი რუტინის დანერგვაზე, ლიპიდებით მდიდარი დამატენიანებლების გამოყენებაზე, სუნთქვადი ან ბიოფუნქციური ნიღბის მასალების შერჩევასა და ნიღბის მკაცრი ჰიგიენის უზრუნველყოფაზე. თერაპიული მიდგომები მოიცავს მცენარეულ ანთების საწინააღმდეგო ნივთიერებებს, როზაცეას და აკნეს სამკურნალო ადგილობრივ და სისტემურ მედიკამენტებს და ბარიერის აღდგენის მიდგომებს. სამომავლო მიმართულებები ასევე მოიცავს ნაზი და ანტიბაქტერიული ნიღბების მასალების შემუშავებას და ტელედერმატოლოგიური სერვისების განვითარებას.

საკვანძო სიტყვები: “მასკნე”, “კონტაქტური დერმატიტი”, “COVID-19”, “მექანიკური აკნე”, “სახის დერმატოზები”, “კანის მიკრობიომი”, “როზაცეა”, “ტელედერმატოლოგია”.