Characteristics of facial skin problems and microbiome variation during wearing masks for fighting against COVID-19

Editor

The COVID-19 pandemic has caused more than 168 million people to be infected and 3 million people to die.[1] Although the COVID-19 vaccination work for the general population has been started, herd immunity cannot be achieved in the short term.[2] Wearing masks is still the most effective means for the public to prevent and control the spread of COVID-19. However, the occurrence of facial skin problems caused by wearing masks may, under some conditions, influence the maintenance of mask wearing among the public. We conducted a cross-sectional survey through online and offline questionnaires to explore the characteristics of facial skin problems and microbiome variation during wearing masks for fighting against COVID-19, from 30 May to 1 July 2020. Among them, 19 subjects were recruited for microbiome detection. Facial skin problems were defined as suffering from itching, stress injury, allergic dermatitis, fungal skin disease and skin maceration while wearing masks against COVID-19.

A total of 4385 valid questionnaires were finally obtained and analysed. Among them, 1981 (45.2%) were male. The average age of the participants was 31.1 ± 11.6 years. Overall, 1323 (33.1%) participants reported having facial skin problems while wearing masks. The incidence of facial skin problems was the highest in the age group of 20–30 years (38.4%), those living in suburbs (35.2%) and those with an occupation in the public services (44.5%). Medical personnel had a high incidence of facial skin problems (40.0%). The incidence was also significantly different among different skin types (Fig. 1). The most common type of facial skin problem was indentation/crush (13.2%), followed by allergic dermatitis (11.1%) and acne/worsening of acne (9.9%). More than half of the patients with facial skin problems experienced healing within a week (54.7%). Although there was no significant difference in genus Simpson index and number of genus ($P > 0.05$), the diversity of the facial microbiome showed a decreasing trend after wearing masks. We found a significant change in the functional pathways of the microbiome ($P = 0.0095$ and $P = 0.011$) and a remarkable decrease in distance after wearing masks in both the dry and oily zones ($P < 0.05$; Fig. 2).

Facial skin problems are noticeable public health problems for individuals wearing masks.[3] Although there is consensus on the importance of protection against skin injuries among medical

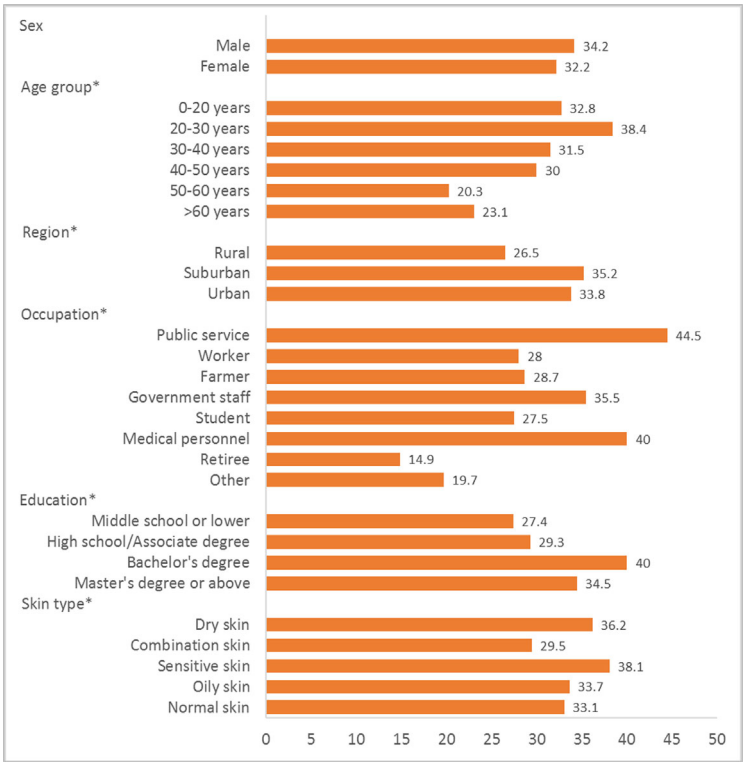

Figure 1 The incidence of facial problems among subgroups.

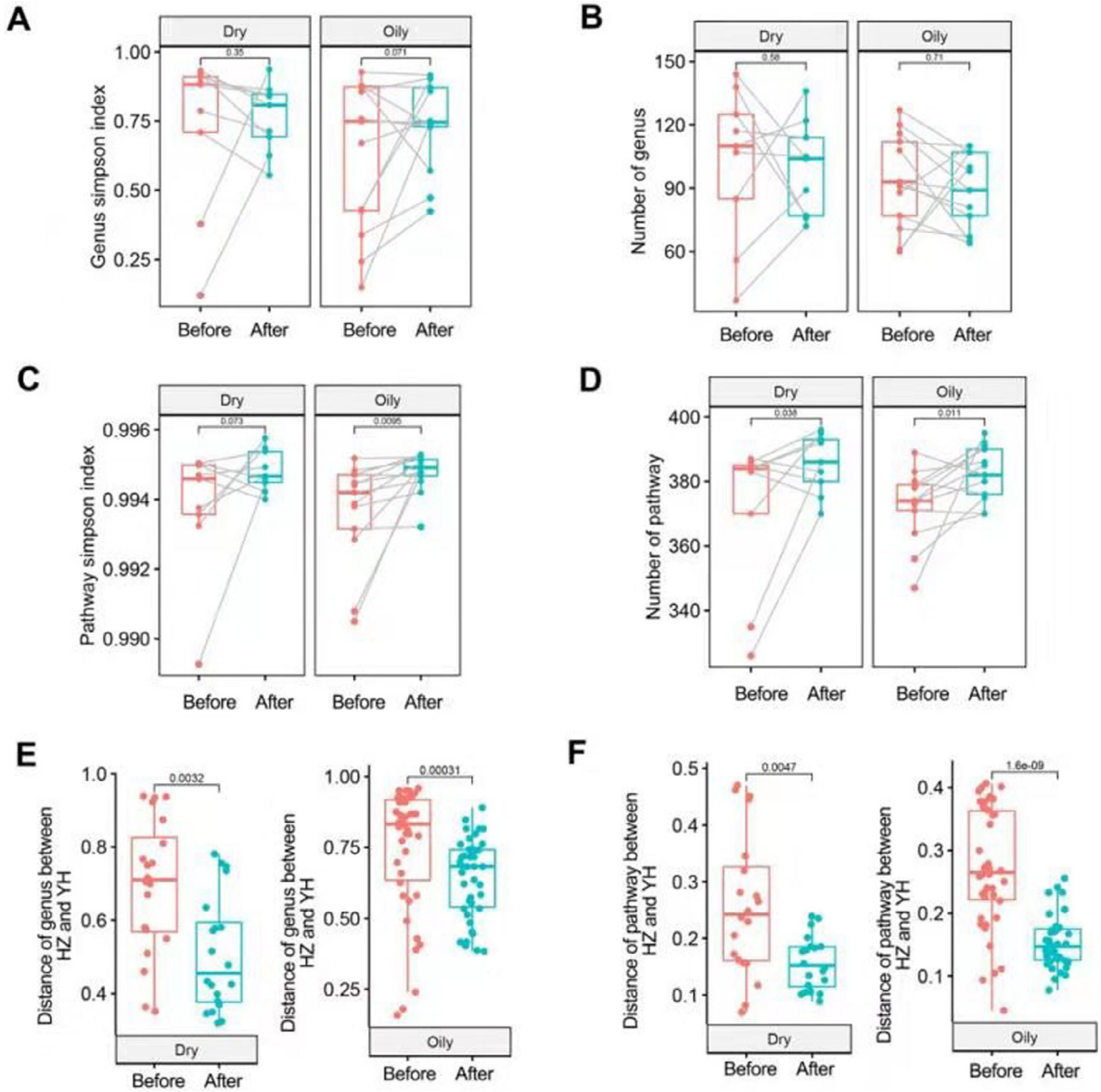

Figure 2 Changing of facial microbiome related to wearing masks.

staff fighting against COVID-19, there were no unified protection guidelines for the general population so far. We found that more than 34% of participants experienced skin problems occurring on the cheek and the bridge of the nose, which was consistent with the results of Jiang et al.[4] The incidence of indentation was the highest. This was caused by habits such as wearing the mask for too long or wearing it too tightly, but this issue disappears by itself under normal circumstances. Indentation experienced by medical staff is usually associated with close contact with the protruding parts of the stiff structure of the masks, so it is usually found in the cheekbones, behind the ears and on the bridge of the nose. The incidence of allergic dermatitis was the second highest. Although mild skin indentations may recover completely on their own, it is still recommended to actively use drug treatment and moisturizing cream for prevention.

There were significant differences in the incidence of skin problems between groups with different skin types. Those with sensitive skin had the highest incidence due to the extreme sensitivity to external stimuli.[5] Those with dry skin

had a slightly higher incidence of facial skin problems than those with oily skin. Changes in the facial microbiome might partly explain the skin problems caused by long-term mask wearing.

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Conflict of interest

All authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Three cases of vesiculobullous non-IgE-mediated cutaneous reactions to tozinameran (Pfizer-BioNTech COVID-19 vaccine)

Dear Editor,

There is a global uptake of vaccination against coronavirus disease 2019 (COVID-19). The Phase III trial of tozinameran, a ribonucleic acid (RNA) vaccine, demonstrated a risk of anaphylaxis at 11.1 cases per million doses.[1] Little is known regarding various non-IgE-mediated cutaneous reactions arising from the use of these vaccines. We report three cases of non-IgE-mediated cutaneous reactions following tozinameran administration, in a tertiary hospital in Singapore.

A 51-year-old gentleman developed deep-seated vesicles over his palms 1 day after administration of the second dose of tozinameran. Examination revealed scattered deep vesicles over bilateral palms, with focal desquamation (Fig. 1a,b). He was diagnosed with acute dyshidrotic eczema and treated with topical betamethasone dipropionate ointment.

A 70-year-old woman was admitted to the hospital for an acute flare of bullous pemphigoid 2 weeks following administration of the first dose of tozinameran. She had a known history of biopsy-proven bullous pemphigoid, which was controlled on tapering, low-dose prednisolone. Other drug and infective histories were unremarkable. Inpatient admission was required. Treatment consisted of prednisolone dose escalation to 0.5 mg/kg/day and application of clobetasol 0.05% cream.

A 38-year-old man presented for fever and pruritic rashes, 5 days after administration of the second dose of tozinameran. Localizing infective symptoms were absent. Drug history was otherwise unremarkable. Erythematous scaly plaques studded with non-follicular pustules and desquamative scales over his trunk and limbs (Fig. 2a,b) was associated with marked neutrophilia. Fungal scrape was negative. Histology was supportive of the diagnosis of acute generalized exanthematous pustulosis (AGEP). Clinical resolution was achieved with topical mometasone cream.

These cases of non-allergic cutaneous reactions consisting of vesiculobullous eruptions demonstrate varying degrees of severity. A case series of 12 patients with delayed large local reactions to mRNA-1273 vaccine described an isolated patient developing papules over the palms 4 days after receiving the vaccine.[2] Eczema flares following vaccination for mumps, measles and rubella have been reported.[3] The pathomechanism of MMR-vaccine aggravating eczema was postulated to be that of increased interleukin-4 levels following infection by the live attenuated virions. Vaccinations may instigate a vigorous host immune response, thereby dysregulating the delicate Th1 and Th2

