

Skin and respiratory ill-health attributed to occupational face mask use

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Background	Face mask use in the workplace has become widespread since the onset of the Covid-19 pandemic and has been anecdotally linked to adverse health consequences.
Aims	To examine reports of adverse health consequences of occupational face mask use received by The Health and Occupation Research (THOR) network before and after the pandemic onset.
Methods	THOR databases were searched to identify all cases of ill-health attributed to ‘face mask’ or similar suspected causative agent between 1 January 2010 and 30 June 2021.
Results	Thirty two cases were identified in total, 18 reported by occupational physicians and 14 by dermatologists. Seventy-five per cent of cases were reported after the pandemic onset and 91% cases were in the health and social care sector. 25 of the 35 (71%) diagnoses were dermatological, the most frequent diagnoses being contact dermatitis (14 cases) and folliculitis/acne (6 cases). Of the seven respiratory diagnoses, four were exacerbation of pre-existing asthma.
Conclusions	There is evidence of an abrupt increase in reports of predominantly dermatological ill-health attributed to occupational face mask use since the start of the pandemic. Respiratory presentations have also occurred.
Key words	Acne; asthma; contact dermatitis; face mask; respiratory protective equipment; rhinitis.

Introduction

Face masks of various types have been widely used in workplaces and other indoor settings since the onset of the Covid-19 pandemic to protect workers from, and reduce transmission of, Severe Acute Respiratory Syndrome Virus 2 (SARS-CoV-2).

Adverse dermatological consequences have been recognised from both prolonged respirator use [1,2] and wearing of face coverings more generally [3]. Subjective breathing difficulties have also been reported in dentists wearing N95 or FFP respirator masks and healthcare workers wearing surgical masks [4].

We summarize cases of ill-health attributed to occupational wearing of face masks or respirators reported to The Health and Occupation Research (THOR) network [5] in the decade preceding official

declaration of the Covid-19 pandemic by The World Health Organisation in March 2020 and the subsequent 15 months.

Methods

THOR cases were identified between 1 January 2010 and 30 June 2021 where the suspected causative agent was face mask, as identified in reports by chest physicians (SWORD), occupational physicians (OPRA), general practitioners (THOR-GP) and dermatologists (EPIDERM) [5]. Free text search terms included: mask, RPE, PPE, surgical, FFP2, FFP3, IIR, N95, face covering, fluid resistant, occlusion. The appropriateness of selected cases was confirmed by two researchers (K.F., L.B.).

Key learning points

What is already known about this subject:

- Use of face masks and respiratory protective equipment at work has become widespread since the onset of the Covid-19 pandemic.
- There is some evidence in the literature of dermatological conditions attributed to face mask use and subjective reports of respiratory symptoms.

What this study adds:

- Since the pandemic onset there is evidence of an abrupt increase in reports of occupational face mask related ill-health, predominantly respiratory and dermatological.
- Contact dermatitis and folliculitis/acne are the most commonly reported dermatological diagnoses.
- Reported respiratory presentations are predominantly exacerbation of pre-existing asthma or conditions affecting upper airways.

What impact this may have on practice or policy:

- As widespread use of face masks at work is likely to continue it is important that occupational health clinicians have awareness of potential adverse health consequences.
- More research is required to enable early treatment or prevention of adverse health effects of face mask use.

Results

Thirty two cases of work-related ill-health attributed to face mask or similar agent were identified from THOR reports. Average age was 39 (range 19–63), and 29 (91%) were female. The predominant sector (29/32 cases) was ‘human health and social care activities’ with one case in each of ‘manufacturing’, ‘education’, ‘public administration and defence’. The most reported occupations were nurses (10/32), and nursing auxiliaries and assistants (7/32). Eighteen cases were reported to OPRA, 14 to EPIDERM and none to SWORD or THOR-GP; 17 (OPRA) and 7 (EPIDERM) were reported after the pandemic onset (Figure 1).

The 32 cases included 35 diagnoses (Table 1). Contact dermatitis (CD) was the most frequent dermatological diagnosis (14/25, 56%). The second most frequent dermatological diagnosis was folliculitis/acne (6/25, 25%). Seven respiratory diagnoses were reported, all attributed to surgical mask use within the healthcare sector with four cases of exacerbation of pre-existing asthma, one of occupational asthma and two ‘other’ respiratory diagnoses (rhinitis with other upper airway symptoms). There were three diagnoses which could not be classified as either dermatological or respiratory.

Discussion

From THOR data, we have identified 32 cases of work-related ill-health attributed to face mask use between 1 January 2010 and 30 June 2021. Most cases were in health and social care and reported after the onset of the Covid-19 pandemic. All cases were reported by either dermatologists (EPIDERM) or occupational physicians (OPRA) with 71% diagnoses being dermatological and 20% respiratory. Identification, and prompt management

of any problems relating to the wearing of masks is critical to ensure individuals remain at work, whilst protecting themselves and others from infection.

Most descriptions of the skin effects of face masks worn during the Covid-19 pandemic are limited to case reports but include exacerbation of pre-existing skin conditions and *de novo* disease [1–3,6]. Serial studies are frequently vague in determining actual diagnoses; for example, a study of 454 people from Thailand [7] uses ‘rashes on the face’ as a diagnostic category. Dermatoses reported include occlusive (acne, rosacea, seborrhoeic dermatitis), frictional (irritant CD) and allergic (allergic CD, immediate type hypersensitivity) effects, in varying quantities, requiring expert investigation and diagnosis.

Whilst seven respiratory diagnoses were reported to OPRA, including five cases of asthma, there were no such cases reported to SWORD. This may reflect that occupational physicians are often required to report a case based on ‘balance of probabilities’ clinical judgement, whereas respiratory physicians usually have access to tests to confirm diagnosis and causal agent. Further information obtained about the case of occupational asthma revealed that the diagnosis was based on history alone with the pandemic precluding further investigation at the time.

It is implausible that wearing a mask could cause occupational asthma due to sensitisation due to the absence of a respirable allergen. However, anecdotally, it is not uncommon for individuals to report respiratory symptoms related to wearing a mask, arising *de novo* or exacerbating a pre-existing respiratory disease. A study of 10 subjects wearing face masks, including 3 with pre-existing asthma, found no evidence of physiological decline in respiratory function [8] although minor changes may be present at high performance [9]. A minimal increase in respiratory resistance has been found when

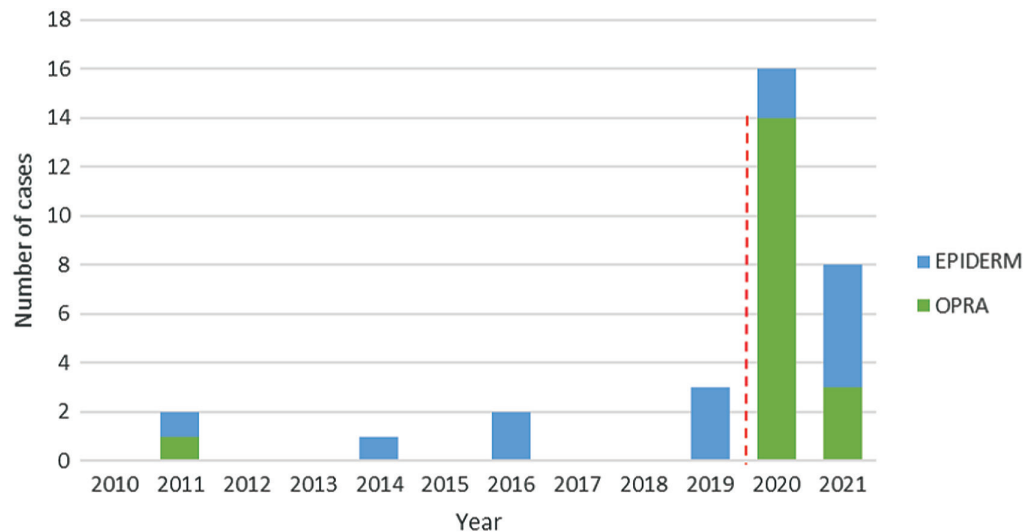


Figure 1. Number of cases reported to the THOR Network January 2010 to June 2021, for which the suspect agent was identified as face mask. EPIDERM and OPRA were the only two schemes containing relevant cases. Dashed line before 2020 shows the start of the COVID-19 pandemic. All 2020 cases were recorded after the start of the pandemic in March 2020.

Table 1. Diagnoses for the cases of ill-health attributed to face mask use reported to EPIDERM and OPRA January 2010 to June 2021

Diagnosis	OPRA	EPIDERM	Totals
<i>Dermatological</i>			
Contact dermatitis	(6)	(8)	(14)
Allergic	0	3	3
Irritant	1	4	5
Unspecified	5	1	6
Contact urticaria	2	1	3
Folliculitis/acne	1	5	6
Other dermatoses	2	0	2
<i>Respiratory</i>			
Asthma	5	0	5
Other respiratory disease	2	0	2
<i>Other</i>			
Suspected type 1 hypersensitivity reactions	2	0	2
Conjunctivitis	1	0	1
Total	21	14	35

wearing tight fitting masks for prolonged periods due to accumulation of moisture in the mask but this is not likely to be clinically relevant. More commonly, respiratory symptoms may arise from subtle changes in the way individuals breathe when wearing a mask and inadequate hydration; irregular breaks can result in reduced oral intake. In combination these factors are more likely to be responsible for subjective reports of feeling lightheaded, commonly and erroneously attributed to gas exchange imbalance [10].

An important limitation of the study is variation in reporter behaviour with a significant reduction in reporting observed during the pandemic. Thus, our results may

be an underestimation of the true figures. Conversely, greater awareness of problems caused by face masks might have resulted in an increase in reporting since 2020. Furthermore, it was not possible to differentiate between types of face mask and it is plausible that the tighter fitting masks may cause more skin and respiratory symptoms than surgical face coverings. A strength of the study is the size of the THOR physician network which includes two networks with a wide reach (OPRA and THOR-GP) and two networks with specialists providing greater diagnostic specificity (EPIDERM and SWORD).

In conclusion, we found evidence of an abrupt increase in work-related ill-health from face masks in the UK during the Covid-19 pandemic. There is robust evidence for dermatological diagnoses but respiratory presentations have also occurred. As widespread use of face masks at work is likely to continue, further research into effective means of prevention and management of its adverse consequences is required.

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References

1. Navarro-Triviño FJ, MeridaFernández C, Ródenas-Herranz T, Ruiz-Villaverde R. Allergic contact dermatitis caused by elastic bands from FFP2 mask. *Contact Dermatitis* 2020;**83**:168–169.
2. Xie Z, Yang Y-X, Zhang H. Mask-induced contact dermatitis in handling COVID-19 outbreak. *Contact Dermatitis* 2020;**83**:166–167.
3. Rudd E, Walsh S. Practice Pointer. Mask related acne ('maskne') and other facial dermatoses. *Br Med J* 2021;**373**:n1304.

4. Farronato M, Boccalari E, Del Rosso E, Lanteri V, Mulder R, Maspero C. A scoping review of respiratory literature and a survey among dental professionals. *Int J Environ Res Public Health* 2020;**17**:5968.
5. Carder M, Hussey L, Money A, *et al.* The Health and Occupation Research network: an evolving surveillance system. *Saf Health Work* 2017;**8**:231–236.
6. Navarro-Triviño FJ, Ruiz-Villaverde R. Letter. Therapeutic approach to skin reactions caused by personal protective equipment (PPE) during COVID-19 pandemic: an experience from a tertiary hospital in Granada, Spain. *Dermatol Ther* 2020;**33**:e13838.
7. Techasatian L, Lebsing S, Uppala R, *et al.* The effects of the face mask on the skin underneath: a prospective survey during the COVID-19 pandemic. *J Prim Care Community Health* 2020;**11**:2150132720966162150132720966167.
8. Ciocan C, Clari M, Fabbro D, *et al.* Impact of wearing a surgical mask on respiratory function in view of a wide-spread use during COVID-19 outbreak. A case-series study. *Med Lav* 2020;**111**:354–364.
9. Scheid JL, Lupien SP, Ford GS, West SL. Commentary: physiological and psychological impact of face mask usage during the COVID-19 pandemic. *Int J Environ Res Public Health* 2020;**17**:6655.
10. Fikenzer S, Uhe T, Lavall D, *et al.* Effects of surgical and FFP2/N95 face masks on cardiopulmonary exercise capacity. *Clin Res Cardiol* 2020;**109**:1522–1530.