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ORIGINAL ARTICLE

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Physical and psychological impacts of handwashing and personal protective equipment usage in the COVID-19 pandemic: A UK based cross-sectional analysis of healthcare workers

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Abstract

The COVID-19 pandemic has necessitated intensified handwashing and mask usage for healthcare staff. A retrospective cross-sectional study was performed primarily to investigate the potential skin damage and secondary impacts on wellbeing of staff resulting from these practices. Additionally the availability and uptake of occupational health services and moisturisers in the work place was also assessed. The survey was distributed to NHS staff between April and May 2020 and asked questions regarding skin damage, impact on wellbeing and availability and utilisation of occupational health input and moisturisers. Of the 211 responders, 167 washed their hands more than ten times per shift. Three quarters of these reported cracks or fissures in one or more regions of their hands, most frequently to the back of the hands or web spaces. Amongst the 157 staff who wore FFP3 masks, redness of the nasal area was most frequently reported with 8% reporting facial blisters. 36% of staff reported a substantial impact on one or more aspects of their wellbeing. Only 7% of respondents had received specialist advice, yet a quarter (26%) had made or anticipated needing changes to their occupational duties. The majority (63%) felt they required no specialist input, despite 38% of these reporting a substantial detriment to their wellbeing. Handwashing and face mask use is resulting in skin damage amongst healthcare workers during the COVID-19 pandemic, with associated detriment to wellbeing. Healthcare services need to take action to implement measures to prevent, reduce and treat damage including promotion of available specialist support.

KEYWORDS
COVID-19, dermatitis, healthcare professional, personal protective equipment, wellbeing

1 | BACKGROUND

Rigorous handwashing and use of personal protective equipment (PPE) has been the first line of defense for healthcare workers in combating the spread of COVID-19. In a landmark study by Lan et al. performed in Wuhan, 97% of surveyed frontline healthcare workers reported increased skin breakage, pain and distress due to recurrent PPE use during initial phases of the COVID-19 pandemic.[1] Common dermatitis related symptoms reported included dryness, itching, erythema and erosions with 76.6% of frontline workers who washed their hands more than 10 times per day suffering from dermatitis.[1] PPE mask wear for more than 6 hours was a risk factor for developing skin disease with resultant breakdown in skin barrier (odds ratio 2.02; 95% confidence interval 1.35-3.01; $P < 0.01$).[1] In a recent

meta-analysis Yu et al., reported occupational dermatitis secondary to protective facial mask use is common amongst health care workers.[2] Irritant contact dermatitis was reported on the cheeks and nasal bridge especially in those who had an atopic background. Allergic contact dermatitis was reported from the straps and adhesives that were used to manufacture the masks and a small proportion also reported acneiform eruption from mask wear.[2]

Our study focused on three main areas of interest, firstly, physical symptoms and signs secondary to mask use and handwashing. Secondly, to evidence associated effects on wellbeing, and perceived need or awareness of access to occupational health or tissue viability for assessment and treatment. Thirdly, we assessed perception of availability of moisturizers in the workplace and whether staff were bringing their own creams to use at work.

WHAT IS ALREADY KNOWN ABOUT THIS TOPIC?

- Working within healthcare is a known risk factor for occupational dermatoses.
- Frontline staff report increased skin breakage due to recurrent handwashing and PPE usage during the COVID-19 pandemic.

WHAT DOES THIS STUDY ADD?

- A characterization of the most frequently reported skin signs and symptoms of the hand and face of healthcare workers during the COVID-19 pandemic in the UK. Pain, a late feature of skin damage and dermatitis, was reported as the most common symptom.
- Evidence of detrimental effect of skin changes on the wellbeing of healthcare staff based on subjective reports of physical discomfort, distress, and sleep disruption
- Evidence of poor access or uptake of specialist services for skin assessment, inconsistent with the reported severity of symptoms and perceived impact on wellbeing and occupational duties.

2 | METHODOLOGY

An anonymous survey was developed with input from dermatologists in training to obtain data on demographics, frequency of handwashing and mask use, skin damage, wellbeing impact and available provisions including access to and perceived need for occupational health or tissue viability services and moisturizer provision.

Questions on self-reported skin symptoms and distribution utilized elements of the hand eczema severity index (HECSI) to characterize the physical changes and symptoms of the hands. Additional facial areas, symptoms, and signs were included.

Wellbeing questions were designed to assess secondary detrimental effects due to skin changes. Respondents were directed to indicate the impact of new or worse skin changes on their sleep, physical discomfort and distress on a 5-point Likert type response ranging from "not at all" to "very much" for each domain.

The project was registered with and approved by Sandwell and West Birmingham NHS Trust as a quality improvement project, with a potential view to publication. The survey was piloted by several volunteers to ensure accessibility and use of terminology.

The survey was conducted between April and May 2020, distributed in an online format, open to all NHS staff via staff bulletins, email circulars and social media. As such a response rate could not be calculated. Respondents were informed that in submitting their responses they were consenting to anonymous data dissemination and publication of information. Data collection were stopped when over 200 responses we received, giving a total of 211 on closure. Data were extracted and analyzed in Microsoft Excel.

3 | RESULTS

3.1 | Demographic data

We had 211 respondents, the majority of whom were in patient facing healthcare roles, and the remainder in other roles within the National Health Service (NHS) including domestic and administrative staff [Appendix 1]. Doctors and nurses made up 43.6% and 25.6% of responses, respectively. 79% of respondents were employed by Sandwell and West Birmingham NHS Trust in the Midlands, UK. 82% of the respondents were female and 31% declared a pre-existing skin condition.

3.2 | Physical signs and symptoms caused by handwashing and PPE use

75% of respondents reported features of severe skin damage, namely, the development of cracks or fissures in one or more areas of their hands. 167 (79%) of individuals washed their hands more than 10 times a day [Figure 1]. In this group the most affected areas of the hands were the back of the hands and web spaces; 77% and 75%, respectively. In these areas, soreness was the most reported feature followed by redness. The palms, wrists and fingers were least affected and the fingertips were the least affected (23%).

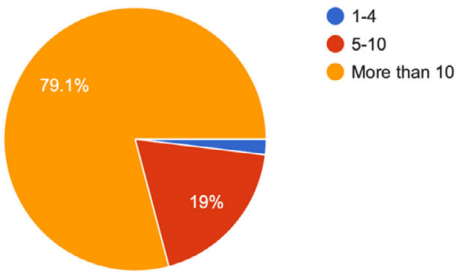

FIGURE 1 Frequency of handwashing during a regular shift

A large proportion, 71% of respondents wore FFP3 masks, 75% wore surgical masks and 7% silicon masks at some point during their working pattern. Staff were utilizing more than one type of mask during their duties. Respondents who wore FFP3 masks reported skin concerns in the nasal area most frequently, followed by cheeks and ears. Soreness was the most prevalent symptom although 8% of reported facial blisters on the nose and ears [Figure 2, Figure 3 and Appendix 2]. 50% of FFP3 mask users reported soreness of the ears vs only 7% of surgical mask users.

3.3 | Wellbeing impacts secondary to skin damage and irritation

36% (76) of respondents reported a substantial impact, defined as quite a lot or very much, on their distress levels, sleep, or physical discomfort associated with new or worsened skin symptoms. Just over a quarter (29%) of respondents reported substantial pain or physical discomfort, with 15% reporting a substantial impact on their anxiety or distress levels and 5% reported substantial disruption to their sleep. A further 34% perceived a minor impact on their distress levels and 21% felt it had disrupted their sleep "a little". This data are summarized in Table 1.

Free text responses to questions on wellbeing emphasized the anxiety and discomfort of needing to wash hands when they are sore, for example, "stinging, anxious to wash hands but then of course anxious not too" and "it is worrisome that I am working in a high-risk environment for coronavirus with cracked hands."

Several respondents highlighted the impact on their sleep, for example, "sleep is disturbed from itching and affects my workday next day", and "scratching at night, anxious, fear of skin damage, stress".

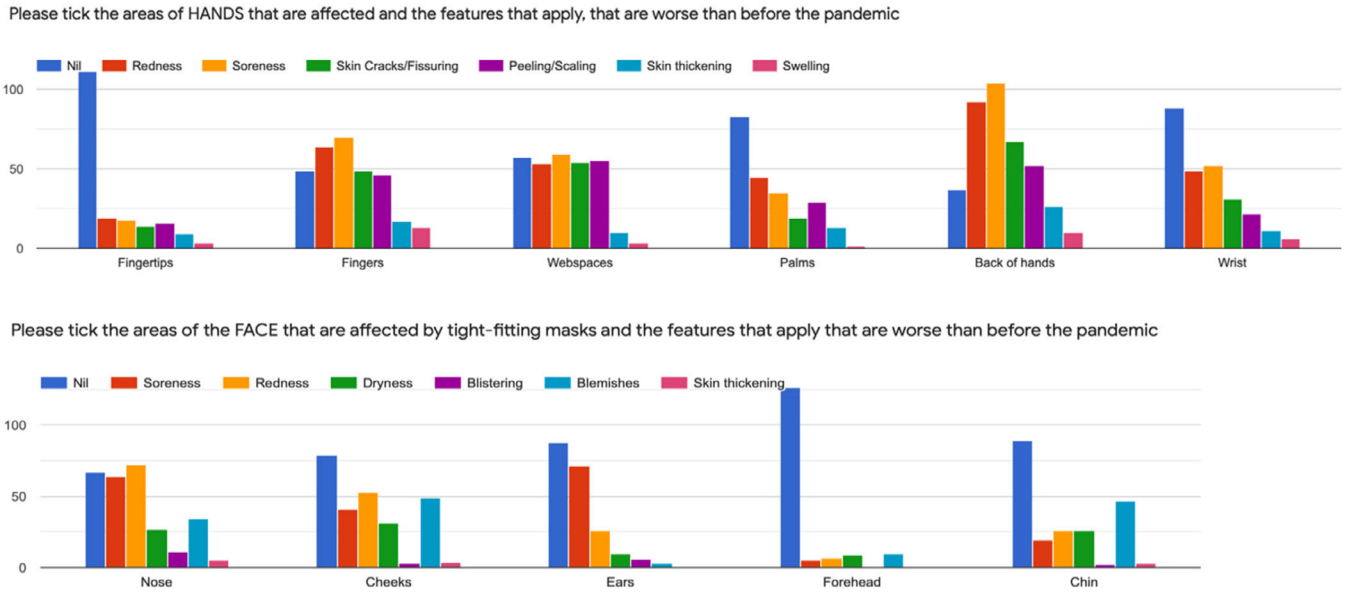

FIGURE 2 A schematic diagram of the signs and symptoms of skin damage due to handwashing and personal protective equipment usage during the COVID-19 pandemic separated in the anatomical areas of the hand and face

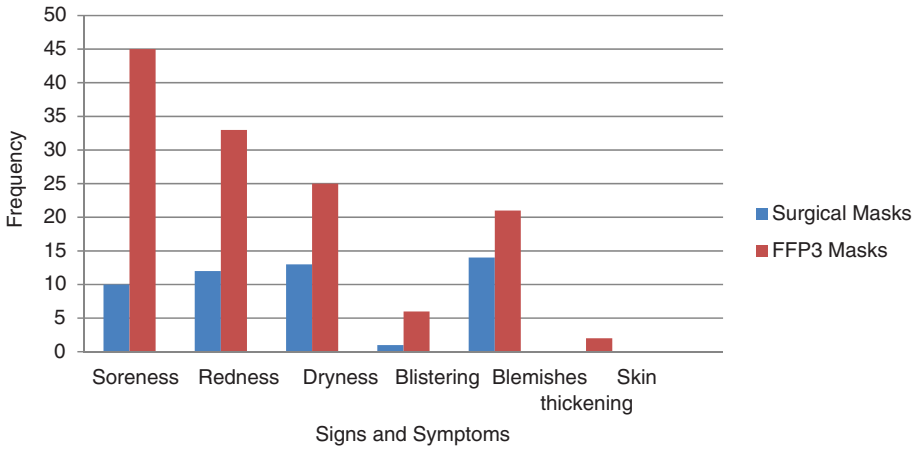

FIGURE 3 A schematic diagram to illustrate the frequency and pattern of signs and symptoms of skin damage reported in staff who exclusively used surgical masks compared to those who exclusively used FFP3 masks

TABLE 1 Self reported impact on wellbeing in terms of physical pain or discomfort, disruption of sleep and worry secondary to new or worsened skin changes

	Pain	Sleep	Worry
Not at all	37	141	72
A little	101	44	94
Quite a lot	50	7	24
Very much	10	4	8
NIL	12	14	12
Substantial	**60**	**11**	**32**

Free text answers also revealed another potential psychological effect with impacts on confidence or embarrassment noted by several respondents, in particular in relation to acne for example, "acne flare up makes me lack confidence to face people". Those with irritated hands reported concern as a result of attention for example, "very aware when people look and comment on the dryness of my hands".

3.4 | Service and emollient provision

3.4.1 | Satisfaction with current available services

The vast majority of respondents (92%) felt that there needed to be more provision of barrier creams and emollients at work. Only 45% of respondents felt moisturizers were readily available in the workplace, with 17.5% saying there was no availability at all. In fact, 80% of respondents said that they brought their own cream to work. One free text response highlighted this concern and the impact on morale. One respondent's response indicates the impact potentially preventable skin irritation can have on their morale "it makes me feel very undervalued and frustrated that there is a solution to the problem but we are denied it by people who do not have to wear this stuff and therefore aren't suffering".

3.4.2 | Accessing occupational health or tissue viability

33% (69) reported needing specialist input, but only 22% (15) of these had been able to access it, the remaining 25% (54) did not know it was available or how to access it.

The majority of respondents (63%, 133) felt they required no specialist input, despite 38% of this group reporting a substantial detriment to wellbeing. Of all respondents only 7% had received specialist input, two of whom had reported significant impacts on all three areas of wellbeing assessed. Four of the individuals who perceived no need for assessment had recorded the highest impact for all three areas of wellbeing impact.

Amongst 9 respondents who reported significant impact in all three domains only 2 had changed work duties, whilst 4 stated they may need to soon, the remaining 3 reported no need to change duties.

Of those with pre-disposing conditions 47% reported needing specialist input, but only 11% of them had been able to access it, with the remaining 36% reporting that they needed advice or assessment but either did not know it was available or how to access it.

3.4.3 | Changing duties or aspects of work

70% (147) of respondents had made no changes to duties to accommodate symptoms and did not anticipate needing to make them soon. Just over a quarter of respondents, 26%, had already made changes or anticipating potentially needing to make them soon; 9% had already made changes and 18% anticipating that they may need to make changes soon. Of this cohort only 2 had received specialist input, 9 of them reported needing input but not knowing it was available or how to access it. The remaining 7 had made changes to their work duties already but did not perceive they needed input. Notably all 7 of these respondents reported skin symptoms and signs indicating irritation or damage to skin was ongoing, and additionally 3 of the 7 reported "quite a bit" of pain or physical discomfort. Of note, a higher proportion (26%) of those with pre-disposing conditions anticipated they may soon need to make changes to their duties and 12% had already made changes to duties. All but one of them recognized their need for specialist input but none knew how to access it.

4 | DISCUSSION

The COVID-19 pandemic necessitated rapid changes in healthcare practices to protect staff and patients. Thorough and frequent handwashing and use of masks were recommended for all those working in the healthcare settings.

The results of our study indicate a high level of skin irritation and damage amongst staff working within UK healthcare settings during the COVID-19 pandemic. Of note,

75% of respondents reported severe features of dermatitis including cracks or fissures, in one or more area of their hands. These data are consistent with previously published data regarding dermatitis amongst healthcare workers during the pandemic.[1]

A study conducted in Wuhan China, showed that of 434 healthcare workers, 74% (321) performed hand hygiene more than 10 times per day, and 76.6% (246) of these frequent washers reported symptoms of dermatitis.[3] Similarly, in a German based study by *Guertler* et al., 90.4% of healthcare workers in a COVID-19 intensive care setting reported symptoms of hand dermatitis.[4] Our data showed that 79% of respondents wash their hands more than 10 times a day, putting them at a similar risk of acquiring dermatitis. Our data includes non-patient facing staff and healthcare professionals working across all departments, which may explain the higher rates reported amongst the German cohort. In the UK two NHS Trusts, which established self-referral occupational dermatology clinics specifically to support frontline workers during the pandemic undertook a

questionnaire-based study.[5] They found that amongst those presenting with hand dermatitis up to 97.1% were diagnosed with irritant contact dermatitis. If this is confirmed in further studies, it would potentially alter the most appropriate preventative interventions.

With one-fifth of our respondents indicating predisposing skin conditions, we must be vigilant moving forward that this number does not escalate. The extent of skin irritation and damage reported by both our participants and those of other international studies is a real concern with regards to infection control.[6] Hand hygiene is compromised by breaks in the skin and the associated pain is likely to make washing or use of alcohol gel painful. Consistent with this several our respondents noted in free text responses their concern regarding infection control; "My hands are sore, so I am catching myself washing them less well, and using less alcohol gel. I understand this puts infection control at risk".

We felt it was important to gain insights into the effects of frequent and prolonged use of masks. Unsurprisingly, compared to those exclusively wearing surgical masks, those wearing FFP3 masks reported greater severity and distribution of skin damage. Although the number of individuals reporting facial blistering was low, only 8% of mask users, this represents severe physical damage secondary to prolonged pressure and irritation to the facial skin. One might anticipate that this degree of damage could lead to infection or scarring or alternatively may lead to altered compliance with mask wear. In fact, in a recent cross-sectional study amongst health workers in the United States, 65% of individuals had modified their PPE to avoid or alleviate skin symptoms.[7]

FFP3 masks rely on a tight seal, and any change to fit or removal whilst in high-risk area may expose the user to COVID-19. When considering the significance of the facial skin changes observed in our cohort, the secondary implications for exposure to COVID-19 must be taken seriously.

Furthermore, healthcare services are already facing increased staffing strain[8] and our data indicates a significant proportion of staff needing or predicting a need to alter duties in response to their skin state. Proactive management and prevention will potentially reduce the need for absences or adjusted duties. Our study indicates a perceived negative impact on wellbeing, with 15% reporting substantial anxiety and 5% a substantial disruption to their sleep. Likewise, a study undertaken in the United States amongst healthcare workers found 16% and 70% had sleep disturbance and anxiety related symptoms respectively associated with their skin problems.[7] These effects combined with physical discomfort can reasonably be predicted to exacerbate distress directly related to frontline work and may overtime increase absence and reduce productivity.

In the United Kingdom, there has been a multi-organizational response to provide rapid access to psychological and mental wellbeing support for NHS staff. Important aspects of this include encouraging staff to take pro-active measures to protect their mental wellbeing, normalizing the need for additional support and to seek help early. Parallels can be drawn when considering the necessary response to the skin damage we and others are reporting. A coordinated response needs to ensure appropriate services are readily available, which staff are encouraged to access and that staff are empowered to seek advice early. The latter point is of particular importance as our data suggests many individuals with either severe skin symptoms and or wellbeing detriment did not perceive a need for specialist input. This apparent lack of insight or high threshold for seeking help will need to be addressed. With rapidly changing PPE guidelines and service needs, messaging and pathways will need to be simple.

We consider that, as with psychological wellbeing, clear messages about pro-active skin protection and management of early dermatitis could have a significant impact on prevalence and severity. Those healthcare workers with pre-disposing conditions in our cohort had a higher degree of wellbeing detriment and symptom burden. In resource limited areas prioritizing this group for access to specialists may be sensible. Furthermore, asides education and assessment our study also emphasized the need to improve access to suitable emollients and barrier creams.

4.1 | Current guidelines and prospective change

Several organizations in the UK and internationally have released guidance on prevention and management of increased skin irritation and damage associated with PPE and handwashing.[9-11]

NHS England recommends hourly breaks when wearing masks for prolonged durations.[12] A statement by the British Association of Dermatologist recommends patting the hands dry rather than rubbing, overnight moisturisation under occlusion and seeking help if signs of hand dermatitis develop.[13] The European Task Force on Contact Dermatitis statement on skin reaction during the COVID-19 pandemic recommended alcohol-based hand solutions containing glycerin for example.[14] Importantly, they highlighted evidence that regular use of a fragrance-free emollient after handwashing improves acceptance of hand-hygiene measures. This is in keeping with our data, which suggest staff want to use creams after handwashing whilst at work.

Guidance released by The American Society for Contact Dermatitis are largely similar to UK and European recommendations.[15] Of note, they stress that alcohol-based hand sanitizer, soaps and synthetic detergents should be devoid of allergenic surfactants, preservatives, fragrances, and dyes to minimize the development of contact dermatitis.

4.2 | Study limitations and further work

We recognize our study will have been affected by recall bias given the nature of the study design. Moreover, we are aware that individuals suffering skin irritation and damage may have been more motivated to complete the survey, creating a selection bias, that may have affected our prevalence data. Conversely, staff working in the highest risk areas, such as, intensive care may have been less likely to participate due to work pressure. Our data are subjective and based on non-specialist assessment of signs and symptoms and may not represent objective measures of dermatitis. The data obtained regarding impact

on sleep, distress levels and physical discomfort are also subjective and were elicited using three short questions. We directed respondents to characterize the changes in their skin and wellbeing that resulted from increased handwashing and PPE usage, yet, without baseline data it is difficult to interpret change and establish causal relationships. Exploration of the psychosocial impact of the skin changes using validated health-related quality of life questionnaires would be valuable.

The majority of people who responded to our survey were staff from one NHS Trust, therefore results may not be representative of the situation in other clinical settings or in other health services. In addition, the majority identified as female, which may be indicative of an increased rate of skin damage amongst females, but we are unable to conclude this based on our data. The number of male responses were insufficient to interpret the differences between genders and further work would be required, which would benefit from inclusion of important demographics such as age and ethnicity, in order to understand personal risk factors.

5 | CONCLUSION

We believe that this data are a valuable snapshot of skin damage secondary to PPE usage and handwashing in the COVID-19 pandemic, its potential impact on wellbeing, and the availability and uptake of resources for support. A large proportion of our respondents reported signs and symptoms of advanced features hand dermatitis, with others experiencing severe facial lesions and associated impacts on wellbeing. Of particular concern we have observed an inconsistency between severity of symptoms and uptake of specialist help. We would urge healthcare services to review provisions and elevate the importance of skin health amongst their staff.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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