The Effect of Personal Protective Equipment (PPE) and Disinfectants on Skin Health During Covid 19 Pandemia

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ABSTRACT

Background: Based on the available evidence, the COVID-19 virus is transmitted through close contact and droplets, not in the form of airborne transmission (airborne) among humans. People at risk of infection are those who are in close contact with or looking after COVID-19 patients. Preventive and mitigation measures are key in both the healthcare sector and the community. Personal protective equipment (PPE) is mandatory to protect healthcare workers from the new coronavirus, but healthcare workers may have skin damage especially associated with long-term use of PPE. Objective: The main purpose in this study is to forward the effects of PPE and disinfectants on health care workers skin health. Methods: From March to May 2020, self-administered face to face questionnaires were distributed to 200 individuals, consisting of healthcare workers who served in the designated departments of tertiary hospitals Famagusta /Cyprus. The questionnaire included questions about the condition of skin damage and the frequency or duration of several infection-prevention measures. Results: The most common protection equipment were surgery mask (91.5%), gloves (87.5%) and hand sanitizer (52.0%). In addition, 141 (70.5%) individuals stated take a bath/shower frequently as a protection method from COVID and 135 (67.5%) individuals stated air conditioning. Most individuals use latex gloves with powder (65.0%) or powder free (62.0%). Mean daily duration of wearing mask was 7.32 ± 4.54 (range 0–24) hours, wearing visor or glasses was 3.16 ± 3.97 (range 0–24) hours, wearing protective apron was 4.20 ± 4.57 (range 0–24) hours and wearing gloves was 5.33 ± 4.03 (range 0–24) hours. Eighty (40.0%) individuals bought personal protective equipment for COVID. Most individuals (73.0%) did not see a COVID patient while 18 (9.0%) individuals sampled from a COVID patient. None of the individuals was COVID positive. Mean stress level was 70.24 ± 23.58 (range 0–100). Most individuals (92.0%) stay at home except working times. Fifty-two (26.0%) individuals had hand dryness (xerosis cutis), 38 (19.0%) individuals had body itching or exanthema, 41 (20.5%) individuals had facial wounds because of mask, visor etc. and 68 (34.0%) individuals had rhinitis. Twenty-nine (14.5%) individuals had treatment because of dermal problems. Conclusion: Atopy, winter season, low humidity frequency of hand washing with detergents / disinfectants can disrupt the hydro-lipid cover of the skin surface and also cause irritation and even the development of contact dermatitis. Two-thirds of healthcare workers wash their hands 10 times a day, but only 22% applied skin protective cream. Also, according to a study, prophylactic dressings have been shown to alleviate pressure injuries associated with the device. Also, longer exposure time is an important risk factor. Latex-free gloves are now a mandatory standard in many hospitals and clinics and have the potential to reduce occupational skin diseases.

Keywords: healthcare workers; PPE, personal protective equipment.
prolonged exposure to PPE and excessive personal hygiene. (3)

Almost all types of PPE – face masks, glasses, face shields, gloves – disinfectants (alcohol, chemical agents soaps) can cause skin problems. Many PPE today is designed for single use. Surgical masks are not designed to be worn for more than 4 hours. Different surgical masks must be worn while examining each patient. During the pandemic, excessive and long term usage of PPE’s resulted in serious side effects. Even aprons can cause overheating and excessive sweating, and when combined with friction, it can lead to intertriginous dermatitis and in some case erythema rashes urticaria. (4)

Skin complications in COVID-19 infection are mainly caused by the hyperhydration effect of PPE, friction, epidermal barrier disruption and contact reactions. Also previously existing skin diseases can aggravate. To minimize skin and mucous barrier disruption, healthcare professionals must comply with the standards of wearing protective equipment and prevent the habitation of unnecessary protective actions (5)

2. OBJECTIVE

The main purpose in this study is to forward the effects of PPE and disinfectants on health care workers skin health. We managed to estimate the prevalence and clinical features of skin conditions faced as a result of frequent usage of various disinfectants and long-time wearing of protective equipment (N95 mask, goggles, face shield, and double layers of gloves) during the epidemic period of COVID-19.

3. MATERIAL AND METHODS

From March to May 2020, self-administered face to face questionnaires were distributed to 200 individuals, consisting of healthcare workers who served in the designated departments of tertiary hospitals Famagusta / Cyprus. The questionnaire included questions about the condition of skin damage and the frequency or duration of several infection-prevention measures.

Statistical Analysis

All analysis were performed on SPSS v21 (SPSS Inc., Chicago, IL, USA). Data are given as mean ± standard deviation (minimum–maximum) for continuous variables and frequency (percentage) for categorical variables. Before and after COVID comparisons were performed with the McNemar test or Marginal Homogeneity test depending count of categories. Two-tailed p-values of less than 0.05 were considered statistically significant.

4. RESULTS

We included 200 (62 males and 138 females) individuals into our study, 135 (67.5%) individuals are between the age of 30 and 50. Most common profession was nurse (36.5%) while 31 (15.5%) individuals were officer, 26 (13.0%) individuals were service/polyclinic staff, 24 (12.0%) individuals were doctor and 20 (10.0%) individuals were 112 staff. Seventy-four (37.0%) individuals were university graduate. Most individuals (81.5%) were working at the state hospital. Fifty-seven (28.5%) individ

Table 1. Summary of individuals characteristics

| Age   |       |
|-------|-------|
| 20–30 | 33 (16.5%) |
| 30–40 | 64 (32.0%) |
| 40–50 | 71 (35.5%) |
| 50–60 | 32 (16.0%) |

| Gender |       |
|--------|-------|
| Male   | 62 (31.0%) |
| Female | 138 (69.0%) |

| Profession |       |
|------------|-------|
| Doctor     | 24 (12.0%) |
| Nurse      | 73 (36.5%) |
| Officer    | 31 (15.5%) |

| Cleaning staff | 11 (5.5%) |
| Radiology staff | 9 (4.5%) |
| Laboratory staff | 1 (0.5%) |
| Service/polyclinic staff | 26 (13.0%) |
| 112 Staff | 20 (10.0%) |
| Physical therapy staff | 5 (2.5%) |

| Education status |       |
|------------------|-------|
| Primary school   | 21 (10.5%) |
| Secondary school | 19 (9.5%)  |
| High school      | 51 (25.5%) |
| University       | 74 (37.0%) |
| Postgraduate     | 35 (17.5%) |

| Hospital |       |
|----------|-------|
| State    | 163 (81.5%) |
| Primary health care | 37 (18.5%) |
| Private hospital | 0 (0.0%) |

| Child(ren) |       |
|-----------|-------|
| None      | 57 (28.5%) |
| 1–2       | 128 (64.0%) |
| 3–4       | 14 (7.0%)  |
| > 4       | 1 (0.5%)   |

| Living with risky group | 69 (34.5%) |
|-------------------------|------------|

| Hospital unit |       |
|---------------|-------|
| Polyclinic    | 85 (42.5%) |
| Emergency     | 39 (19.5%) |
| Service       | 48 (24.0%) |
| COVID isolation service | 3 (1.5%) |
| COVID polyclinic | 6 (3.0%) |
| Intensive care | 12 (6.0%) |
| Primary health care | 3 (1.5%) |
| 112           | 17 (8.5%) |

| Secondment for COVID | 67 (33.5%) |
|---------------------|------------|

| Working hours (weekly) | 42.77 ± 16.00 (5–100) |
|------------------------|------------------------|

| Chronic disease | 64 (32.0%) |
| Hypertension    | 22 (11.0%) |
| Heart disease   | 10 (5.0%)   |
| Renal disease   | 2 (1.0%)    |
| Diabetes mellitus | 10 (5.0%) |
| Lung disease    | 7 (3.5%)    |
| Cancer          | 1 (0.5%)    |
| Others          | 29 (14.5%)  |

Data are given as mean ± standard deviation (minimum–maximum) for continuous variables and as frequency (percentage) for categorical variables.
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Individuals had no children. Sixty-nine (34.5%) individuals were living with risky group like older than 65 years or with chronic disease. Eighty-five (42.5%) individuals were working at polyclinic, while 48 (24.0%) individuals were working at service and 39 (19.5%) individuals were working at emergency department. Sixty-seven (33.5%) individuals had secondment for COVID. Mean working hours in a week was 42.77 ± 16.00 (range 5–100). Sixty-four (32.0%) individuals had at least one chronic disease, the most common chronic diseases were hypertension (11.0%), heart diseases (5.0%) and diabetes mellitus (5.0%) (Table 1).

The most common protection equipment were surgery mask (91.5%), gloves (87.5%) and hand sanitizer (52.0%). In addition, 141 (70.5%) individuals stated take a bath / shower frequently as a protection method from COVID and 135 (67.5%) individuals stated air conditioning. Most individuals use latex gloves with powder (65.0%) or powder free (62.0%). Mean daily duration of wearing mask was 7.32 ± 4.54 (range 0–24) hours, wea-

**Table 2. Summary of individuals answers**

| Protection Method | Frequency |
|-------------------|-----------|
| Surgery mask      | 183 (91.5%) |
| FFP1, FFP2, FFP3, N99 | 26 (13.0%) |
| N95               | 27 (13.5%) |
| Gloves            | 175 (87.5%) |
| Cologne / Refreshing towel | 72 (36.0%) |
| Protective apron  | 101 (50.5%) |
| Visor / glasses   | 70 (35.0%) |
| Hand sanitizer    | 104 (52.0%) |
| Gargling with water | 38 (19.0%) |
| Gargling with antiseptic | 11 (5.5%) |
| Avoid handshake   | 8 (4.0%) |
| Social distancing | 7 (3.5%) |
| Frequently handwash | 3 (1.5%) |
| Frequently bath / shower | 141 (70.5%) |
| Air conditioning  | 135 (67.5%) |
| Cleaning with UV / ozone | 12 (6.0%) |
| Aromatherapy      | 0 (0.0%) |
| Gloves type       |           |
| Latex with powder | 130 (65.0%) |
| Powder free latex | 124 (62.0%) |
| Nylon             | 4 (2.0%) |
| Plastic           | 11 (5.5%) |
| Cotton / nitrite  | 3 (1.5%) |
| Daily duration (hours) of wearing... |
| Mask              | 7.32 ± 4.54 (0–24) |
| Visor / glasses   | 3.16 ± 3.97 (0–24) |
| Protective apron  | 4.195 ± 4.57 (0–24) |
| Gloves            | 5.33 ± 4.03 (0–24) |
| Bought personal protective equipment | 80 (40.0%) |
| Relationship with COVID |         |

**Figure 1. Hand wash percentages before and after COVID**

**Figure 2. Face wash percentages before and after COVID**

on (11.0%), heart diseases (5.0%) and diabetes mellitus (5.0%) (Table 1).

The most common protection equipment were surgery mask (91.5%), gloves (87.5%) and hand sanitizer (52.0%). In addition, 141 (70.5%) individuals stated take a bath / shower frequently as a protection method from COVID and 135 (67.5%) individuals stated air conditioning. Most individuals use latex gloves with powder (65.0%) or powder free (62.0%). Mean daily duration of wearing mask was 7.32 ± 4.54 (range 0–24) hours, wea-
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Table 3. Summary of individuals habits and status before and after COVID

| Activity                  | Before     | After      | p       |
|---------------------------|------------|------------|---------|
| Hand wash (daily)         |            |            |         |
| 1–4                       | 22 (11.0%) | 6 (3.0%)   | <0.001  |
| 5–9                       | 61 (30.5%) | 21 (10.5%) |         |
| 10–14                     | 48 (24.0%) | 36 (18.0%) |         |
| > 15                      | 69 (34.5%) | 137 (68.5%)|         |
| Hand wash (duration)      |            |            |         |
| 0–9 seconds               | 51 (25.5%) | 3 (1.5%)   | <0.001  |
| 10–19 seconds             | 59 (29.5%) | 59 (29.5%) |         |
| 20–29 seconds             | 59 (29.5%) | 59 (29.5%) |         |
| > 30 seconds              | 31 (15.5%) | 79 (39.5%) |         |
| Face wash (daily)         |            |            |         |
| 1–4                       | 10 (5.0%)  | 16 (8.0%)  | 0.002   |
| 5–9                       | 75 (37.5%) | 40 (20.0%) |         |
| 10–14                     | 62 (31.0%) | 61 (30.5%) |         |
| > 15                      | 53 (26.5%) | 83 (41.5%) |         |
| Shower (weekly)           |            |            |         |
| 1–2                       | 7 (3.5%)   | 12 (6.0%)  | <0.001  |
| 3–5                       | 46 (23.0%) | 25 (12.5%) |         |
| 5–7                       | 73 (36.5%) | 39 (19.5%) |         |
| > 7                       | 74 (37.0%) | 124 (62.0%)|         |
| Hand moisturizer (daily)  |            |            |         |
| 0                         | 43 (21.5%) | 31 (15.5%) | <0.001  |
| 1–2                       | 87 (43.5%) | 61 (30.5%) |         |
| 3–5                       | 38 (19.0%) | 36 (18.0%) |         |
| > 5                       | 32 (16.0%) | 72 (36.0%) |         |
| Hand problems (eczema/dermatitis) | 41 (20.5%) | 57 (28.5%) | 0.053   |
| Face problems (xerosis cutis/dermatitis) | 14 (7.0%) | 40 (20.0%) | <0.001  |
| Hair loss                 | 53 (26.5%) | 66 (33.0%) | 0.026   |
| Hand over-sweating        | 31 (15.5%) | 28 (14.0%) | 0.710   |
| Acne                      | 25 (12.5%) | 32 (16.0%) | 0.310   |
| Data are given as frequency (percentage) |

5. DISCUSSION

In this issue of JAAD, Lan et al. Report a high incidence of cutaneous complications related with PPE among healthcare workers treating patients with epidemic coronavirus (COVID-19) infection. It may be difficult to continue wearing protective clothing against cutaneous ulceration, and trying to shift pressure and wear points can reduce the effectiveness of the protective mask.(5) Atopy, winter season, low humidity frequency of hand washing with detergents / disinfectants can disrupt the hydro-lipid cover of the skin surface and also cause irritation and even the development of contact dermatitis.
(3) two-thirds of healthcare workers wash their hands 10 times a day, but only 22% applied skin protective cream. Also, according to a study, prophylactic dressings have been shown to alleviate pressure injuries associated with the device. Also, longer exposure time is an important risk factor.

Latex-free gloves are now a mandatory standard in many hospitals and clinics and have the potential to reduce occupational skin diseases.

6. CONCLUSION

Outbreaks of COVID-19 are now reported worldwide and all physicians must be prepared for cases in their community. The prevalence of skin damage in our study was very high among healthcare professionals. Although it is known exactly what the scope of the problem is, there is very few literature on effective measures to reduce the incidence of occupational skin injuries among healthcare workers. Simple interventions, including the use of adhesive barrier films before wearing protective equipment, moisturising the skin after disinfection can help to maintain a vital workforce for the care of patients with the disease.

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