

**FIGURE 1** (A) Patient with localized wheals and diffuse face swelling after using a hydrolysed wheat protein (HWP)-containing face mask. (B) Skin prick test results of the patient's own HWP-containing cosmetics. (C) Generalized urticaria after oral challenge with gluten and cofactors (alcohol, aerobic exercise)

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## CONFLICT OF INTEREST

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## SUPPORTING INFORMATION

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# Implementation of a distance learning hand eczema prevention program for healthcare workers during the COVID-19 pandemic

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## INTRODUCTION

Occupational hand eczema (HE) is a major risk for healthcare workers. It is attributed to hand hygiene practices, in particular to frequent hand washing and use of occlusive gloves. Programs of skin care education are beneficial for its prevention and have particularly been implemented in Northern Europe, more recently also in Italy.<sup>1-4</sup>

The prevalence of HE in healthcare workers significantly augmented during the COVID-19 pandemic due to increased hand hygiene measures recommended by WHO to prevent SARS-CoV-2 spreading.<sup>5-8</sup> At the same time, the pandemic hindered face-to-face classes, including those for HE prevention.

We implemented a distance learning HE prevention program and investigated its effect in healthcare workers of the Ospedale Policlinico San Martino, Genoa, Italy.

## METHODS

The program consisted of six online lectures and three tutorial videos concerning all the known risk factors of HE in healthcare workers in general, plus details that addressed the reality of our own hospital. One of them specifically addressed how to cope with both HE prevention and SARS-CoV-2 prevention. For example, we knew that in COVID wards healthcare workers could not avoid wearing a double pair of occlusive gloves for over 6 h on end. We therefore taught that, at the end of the shift, they should not wash their hands with water plus the rather irritant sanitizing soap available in our hospital but use an oily solution or simply rinse their hands, then pat them dry and immediately apply an emollient cream.

The desired outcomes were to make the participants aware of relevant risk factors and to encourage them to adopt correspondent healthy skin behaviours. In particular we stressed out the fact that: overzealous hand washing is a major risk for HE and should be reduced; using a well formulated alcoholic gel is preferable, whenever possible; prolonged wearing of the same pair of gloves should be avoided and gloves should be changed after maximum 20', whenever possible; hands should be dry before wearing the gloves, both after washing them with water and soap and after applying an alcoholic rub or an emollient cream; an emollient cream should be applied at least before and immediately after the work shift and at bedtime, if possible also several times during the day.

The efficacy of the intervention was assessed by a questionnaire administered at the beginning of the program and 2 months after its completion.

## RESULTS

Eighty-two healthcare workers (17 males, 65 females, mean age 47.02 ± 10.80 years, 23.95 ± 10.88 working years in healthcare) completed the program. Nurses were 62.20%, physicians 8.54%, social health operators 7.32%, laboratory technicians 6.10%, others 15.86%; 53.66% had worked/worked in "COVID wards". Among participants, 21.95% had a history of atopic dermatitis, 32.93% of allergic rhinitis/asthma and 23.17% of allergic contact dermatitis confirmed by patch testing. A summary of the most important pre- and post-course answers and their statistical analysis is shown in Table 1; full detail of all answers in Table S1.

## DISCUSSION

The educational intervention induced significant changes in recognition of HE [odds ratio (OR) 4.93, 95% confidence interval (95%CI) 1.03–23.58] and awareness of some risk factors, namely: frequent hand washing with soap and water (OR 2.32, 95% CI 1.01–5.34), surgical hand disinfection (OR 2.39, 95% CI 1.26–4.54), prolonged wearing of gloves (OR 4.97, 95% CI 2.02–12.28). Accordingly, at work many participants significantly reduced prolonged wearing of gloves (OR 1.91, 95% CI 1.02–3.57) and excessive hand washing with soap and water (OR 2.73, 95%CI 1.42–5.24). Extra-working risk behaviours were minimally improved. Hand cream use significantly increased before and after work-shift (OR 2.95, 95%CI 1.52–5.74, and OR 2.16, 95% CI 1.09–4.30, respectively) and at home/outside work (OR 4.15, 95% CI 1.87–9.24).

All participants considered the intervention helpful and applied at least in part the advices received.

Our data indicate a positive effect of a distance educational intervention for healthcare workers during the COVID-19 pandemic.

## AUTHOR CONTRIBUTIONS

**Rosella Gallo:** Conceptualization; investigation; writing – original draft; methodology; visualization; writing – review and editing; formal analysis; project administration; data curation; supervision; validation. **Fabrizio**

**TABLE 1** Behavioural changes and modification of knowledge of main HE risk factors after the educational intervention

Questionnaire item	At baseline	At follow-up	OR (95% CI)
Prevalence of reported hand eczema among the participants			
Have you ever had hand eczema?			
Yes/no	73 (89.02%)	80 (97.56%)	4.93 (1.03–23.58)
Do not know	9 (10.98%)	2 (2.44%)	
Do you have hand eczema just now?			
Yes/no	79 (96.34%)	82 (100.00%)	N/A
Do not know	3 (3.66%)	0 (0.00%)	
Knowledge of risk factors for hand eczema			
In your opinion, which of the following is a risk factor for hand eczema?			
Use of cleaning and sanitizing agents			
Yes	73 (89.02%)	79 (96.34%)	3.25 (0.85–12.46)
No/do not know	9 (10.98%)	3 (3.66%)	
Washing hands with water and soap >20 times per day			
Yes	62 (75.61%)	72 (87.80%)	2.32 (1.01–5.34)
No/do not know	20 (24.39%)	10 (12.20%)	
Use of alcohol-based hand disinfectant >10 times per day			
Yes	66 (80.49%)	64 (78.05%)	0.86 (0.40–1.84)
No/do not know	16 (19.51%)	18 (21.95%)	
Surgical hand washing >3 times per day			
Yes	40 (48.78%)	57 (69.51%)	2.39 (1.26–4.54)
No/do not know	42 (51.22%)	25 (30.49%)	
Wearing protective gloves >2 h during a work shift			
Yes	56 (68.29%)	75 (91.46%)	4.97 (2.02–12.28)
No/do not know	26 (31.71%)	7 (8.54%)	
Working risk behaviours			
How many times do you wash your hands with water and soap during your work?			
Up to 10 times per day	22 (26.83%)	41 (50.00%)	2.73 (1.42–5.24)
>10 times per day	60 (73.17%)	41 (50.00%)	
How many times do you apply a alcohol-based hand disinfectant during your work?			
Up to 10 times per day	36 (43.90%)	37 (45.12%)	1.05 (0.57–1.95)
>10 times per day	46 (56.10%)	45 (54.88%)	
Do you wear gloves >2 h during a work shift?			
No	39 (47.56%)	52 (63.41%)	1.91 (1.02–3.57)
Yes	43 (52.44%)	30 (36.59%)	
Extra-working behaviours			
How many times do you wash your hands at home/outside work?			
Up to 10 times per day	48 (58.53%)	58 (70.73%)	1.71 (0.90–3.27)
>10 times per day	34 (41.47%)	24 (29.27%)	
Do you currently do the housework?			
Never	0 (0.00%)	1 (1.22%)	N/A
Sometimes/everyday	82 (100.00%)	81 (98.78%)	
Do you use protective gloves when you do the housework?			
Never	6 (7.32%)	10 (12.20%)	1.76 (0.61–5.09)
Sometimes/everyday	76 (92.68%)	72 (87.80%)	
Do you care for children under 4 years?			
Never	63 (76.83%)	59 (71.95%)	0.77 (0.38–1.56)
Sometimes/everyday	19 (23.17%)	23 (28.05%)	

(Continues)

TABLE 1 (Continued)

Questionnaire item	At baseline	At follow-up	OR (95% CI)
Use of hand cream			
How often do you use a hand cream?			
Before your work-shift			
Always/sometimes	42 (51.22%)	62 (75.61%)	2.95 (1.52–5.74)
Never	40 (48.78%)	20 (24.39%)	
During your work-shift			
After I wash my hands/sometimes	50 (60.98%)	59 (71.95%)	1.64 (0.85–3.16)
Never	32 (39.02%)	23 (28.05%)	
At the end of your work-shift			
Always/sometimes	51 (62.20%)	64 (78.05%)	2.16 (1.09–4.30)
Never	31 (37.80%)	18 (21.95%)	
At home/outside work			
Often during the day/at bedtime	52 (63.41%)	72 (87.80%)	4.15 (1.87–9.24)
Never	30 (36.59%)	10 (12.20%)	

Abbreviations: 95% CI, 95% confidence interval; OR, odds ratio.

**Guarneri:** Methodology; formal analysis; data curation; visualization; writing – review and editing; writing – original draft; conceptualization; supervision; project administration; software; validation. **Giulia Gasparini:** Writing – review and editing; conceptualization; investigation; visualization; resources. **Giorgio Oddenino:** Conceptualization; investigation; visualization; writing – review and editing. **Luca Carmisciano:** Visualization; formal analysis; data curation. **Elisabetta Rovini:** Visualization; formal analysis; project administration; supervision; software. **Aurora Parodi:** Visualization; writing – review and editing; supervision; project administration; writing – original draft.

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