

Occupation-Related Symptoms in Hairdressers

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Background: During work, hairdressers are exposed to several hazardous agents that can cause skin and respiratory symptoms. Because few data are available for long-term follow-up, and none are from Italy, the aim of our study was to investigate occupational symptoms in hairdressers after a 10-year follow-up.

Methods: Work-related skin and respiratory symptoms were investigated in 2006 and 2016 by means of a standardized questionnaire and medical examination.

Results: Eighty-two workers completed the 10-year follow-up with a response rate of 86.3%. At follow-up, skin- and respiratory work-related symptoms had increased significantly, involving 40.7% of workers. Skin symptoms increased to 12.5%, throat irritation to 15.6%, and cough to 12.5%. The occurrence of the symptom of skin irritation was significantly related to dryness of the skin at the baseline.

Conclusions: Our long-term follow-up on hairdressers demonstrated an increase in work-related irritant skin and upper respiratory symptoms that involved more than one-third of the population studied. More efforts are needed in prevention activities to promote better ventilation of workplaces, use of less irritating and less sensitizing hair products, and use of moisturizers to prevent dry skin.

During their working hours, hairdressers are exposed to several hazardous agents.^{1–3} Many irritants and allergens are commonly associated with the development of health problems in the hairdressing profession.^{4,5} Skin and respiratory tract are the main targets of a daily exposure to irritant and allergenic substances. Hence, hairdressers are at high risk of work-related dermatological and respiratory disorders.^{6,7}

The occupational health risks of hairdressers are related to their intense contact with hundreds of chemicals contained in hair products,^{8,9} in a context of frequent exposure to water and detergent substances (wet work), which has been shown to enhance the irritation and sensitization.^{10,11} It has been found that hairdressing has an excess risk of occupational contact dermatitis^{12,13}; especially hand eczema¹⁴; contact urticaria¹⁵; urticaria on the hand, wrists, or forearms⁶; and asthma and rhinitis.^{9,16}

Skin disorders are reported to affect up to 50% of hairdressers.¹⁷ The tendency to develop occupational dermatitis increases with exposure time,¹⁵ and can begin within a few years of work.^{18–20} Hand eczema has a higher incidence among hairdressers than the general population,^{6,21} and *p*-phenylenediamine is the most common cause of allergic contact dermatitis.^{9,22} Airway

symptoms have been reported with a prevalence of 11.2% among hairdressers.²³ A prospective study found that the same cohort of hairdressers complained of more respiratory symptoms after a 5-year follow-up compared with baseline.²⁴ Persulfates from hair bleaching products are the main cause of occupational rhinitis and asthma in hairdressers,^{4,25} and it seems that rhinitis symptoms, generally considered a risk factor for asthma, develop sooner than wheezing.⁶

Prospective (follow-up) studies are usually the preferred approach for evaluating the cause-and-effect relationship between exposure and health outcomes. Few such studies among hairdressers have been published,^{6,24,26–29} most of which have been conducted without long-term follow-up.

We have performed a 10-year follow-up study with the aim of examining the changes from 2006 to 2016 in the dermatological and respiratory symptoms in a fixed cohort of hairdressers exposed to cosmetic products, wet work, and glove wearing.

METHODS

In 2006, a campaign to prevent occupational diseases started with the recruitment of working hairdressers (*n* = 95) in Pordenone province (northeast Italy) and affiliated with the professional category of the area. Three of them with a seniority of work less than 1 year and younger than 18 years were apprentices.

All underwent a medical examination with an occupational physician and a full respiratory and skin anamnesis using a standardized questionnaire derived from the Nordic Occupational Skin Questionnaire³⁰ and from previous studies on respiratory

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allergies.^{31,32} Workers received information on prevention procedures to avoid work-related diseases and personal training with the occupational physician focusing on skin and respiratory diseases as well as on musculoskeletal disorders. They received written instructions on preventive measures to be adopted during work.

After 10 years, all workers were contacted again by phone call and were invited to undergo a new medical examination to investigate work-related symptoms or diseases. During the phone call, they were asked to answer the same questionnaire done 10 years ago.

The study was inserted in a compulsory program for prevention of occupational diseases following the Italian Law 81/2008, and local ethics committee was informed about the analysis performed. Written informed consent was obtained from all subjects.

Questionnaire

The questionnaire used contained information on personal (skin, eye, nose, throat, and lower respiratory tract symptoms) and familial allergic diseases, drug intake, smoking habits, exposure to irritants, and symptoms in connection with this exposure, as well as the usage of safety equipment.^{31,32} Symptoms due to work as a hairdresser were defined by their occurrence during or after working hours. Questions were divided into the following: nasal symptoms defined as sneezing or running nose with production of nasal secretions, asthma defined as the presence of shortness of breath and wheezing, cough defined as cough without secretions, urticaria as the onset of red and wheal reaction disappearing in hours, throat irritation as a painful or scratchy feeling at the back of the throat, contact dermatitis defined as the presence of itching and red skin with papules or vesicles persistent for days, and atopic dermatitis as a long-lasting itching dermatitis that involved flexures.

Exposure Evaluation

As a surrogate for exposure intensity, we evaluated the work tasks performed in a typical week considering percentages of time spent in hair washing, perming, dyeing, bleaching, and highlights, as well as in manicure and salon cleaning.

Statistical Analysis

All data were stored in an Excel spreadsheet (Microsoft Corporation, Redmond, WA) and statistical analysis was performed using STATA, (StataCorp, College Station, TX). Comparison between first and second examinations was performed using McNemar *t* test for paired data or analysis of variance. Factors involved in irritant contact dermatitis during the follow-up were analyzed using the generalized equation estimation. *P* < 0.05 was settled as significant.

RESULTS

Participation

At baseline, the prospectively followed cohort of hairdressers consisted of a total of 95 participants. At follow-up 10 years after the baseline assessment, 13 of the original 95 participants were untraceable, thus yielding a response rate of 86.3% (82/95). Of the 82 respondents, 64 (78.1%) were still working as hairdressers, and 18 (21.9%) had left the trade during the 10-year follow-up period. The latter were asked to explain the reasons for leaving the profession: 4 retired, 1 died, and 8 (9.7%) left the job to raise children; 1 became a teacher in the hairdressers' vocational school; 3 changed their work without medical reason; and 1 left the profession because of the onset of throat irritation and metallic flavor in the mouth during work.

TABLE 1. Main Characteristics of the Hairdressers at Baseline (2006) and at Follow-up (2016)

	2006 Hairdressers (n = 95)	2016 Not Traceable (n = 13)	2016 No Longer Hairdressers (n = 18)	2016 Hairdressers (n = 64)
Age, mean (SD), y	33.7 (11.7)	46.5 (11.2)	45.2 (11.4)	42.4 (11.8)*
Work seniority, mean (SD), y	15.7 (11.6)	28 (12.6)	27.2 (11.6)	24.7 (11.2)*
Female, n (%)	81 (85.3)	10 (76.9)	13 (72.2)	58 (90.6)
Family history of allergy, n (%)	16 (16.8)	2 (15.4)	2 (11.1)	23 (35.9)*
Current smokers, n (%)	34 (35.8)	6 (46.1)	8 (44.4)	17 (26.6)
Ex-smokers, n (%)	7 (7.4)	1 (7.7)	2 (11.1)	5 (7.8)
History of allergic disorders, n (%)				
Asthma	4 (4.2)	1 (7.7)	1 (5.5)	3 (4.7)
Rhinitis	1 (1.1)	0	0	3 (4.7)
Urticaria	3 (3.2)	0	0	2 (3.1)
Cough	1 (1.1)	0	0	8 (12.5)*
Pollen allergy	6 (6.3)	0	1 (5.5)	3 (4.7)
Dust mite allergy	8 (8.4)	0	0	5 (7.8)
Atopic dermatitis	1 (1.1)	0	0	2 (3.1)
Nonoccupational contact dermatitis	5 (5.3)	0	0	6 (9.4)
On hands	4 (4.2)	0	0	5 (7.8)
On face	1 (1.1)	0	0	1 (1.6)
On body	2 (2.1)	0	0	1 (1.6)

**P* < 0.05.

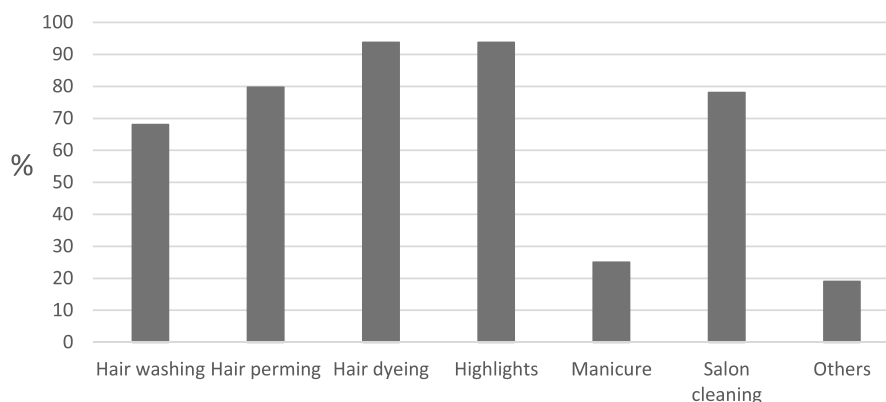


Figure 1. Work tasks performed by hairdressers during the second follow-up.

Characteristics of the Study Population

Table 1 shows the main characteristics of the study participants at baseline, in 2006, and 10 years later, in 2016. Data on hairdressers who were not traceable and those who were no longer hairdressers were included in the table. At baseline, the 95 hairdressers consisted of 81 females and 14 males aged between 16 and 70 years, with a mean (SD) age of 33.7 (11.7) years, with a seniority of work of 15.7 (11.6) years. The female participants were 85.3% (81/95) at baseline and 90.6% (58/64) at follow-up. The number of participants with a family history of allergy had significantly increased from 2006 to 2016 (16.8% vs 35.9% [23/64], $P < 0.05$). Conversely, smoking was more prevalent among baseline hairdressers (35.8% [34/95] vs 26.6% [17/64]).

History of allergic disorders was also investigated (Table 1). Asthma and urticaria prevalence rates were similar at baseline and at 10-year follow-up (4.2% vs 4.7% and 3.2% vs 3.1%, respectively). History of atopic dermatitis was found in only 1 (1.1%) of the baseline subjects and 2 (3.1%) of the follow-up participants.

Data about performed work-related tasks were collected in 2016: 44 (68%) carried out hair washing, 51 (79.7%) performed hair perming,

60 (93.7%) applied hair dyes and bleaches, 60 (93.7%) applied highlights, 16 (25%) carried out manicure treatments, 50 (78.13%) did the cleaning of the hairdressing salon, and 19 (29.7%) also performed other activities than those mentioned previously (Fig. 1).

Skin and Respiratory Disorders in Hairdressers

Table 2 shows the reported prevalence of work-related dermatological and respiratory disorders among participants at baseline (total and those who completed the follow-up) and 10 years later. Dryness of the skin was the most common complaint involving 45.3% and 67.2% of hairdressers in the first and last control, respectively ($P = 0.001$). Contact dermatitis affected 3 (4.7%) of the baseline subjects and 8 (12.5%) of the follow-up participants. Use of corticosteroid creams was reported by only 1 (1.1%) of the total baseline subjects, whereas 15 (23.4%) of the hairdressers reported its use. The number of participants who underwent dermatological visits and allergy tests had increased by 7.2% (5 [5.3%] vs 8 [12.5%]) and 8.2% (7 [7.4%] vs 10 [15.6%]), respectively. In 2006, only 7 workers underwent patch test, and all revealed allergens; in 2016, 3 more had patch tests with negative results. Hairdressers who complained of

TABLE 2. Work-Related Dermatological and Respiratory Disorders Among Hairdressers at Baseline (2006) and at Follow-up (2016)

	2006 Hairdressers (n = 95)	2006 Hairdressers (n = 64)	2016 Hairdressers (n = 64)
Dryness of the skin, n (%)	38 (40)	29 (45.3)	43 (67.2)*
Contact dermatitis, n (%)	4 (4.2)	3 (4.7)	8 (12.5)
Use of corticosteroid creams, n (%)	1 (1.1)	0	15 (23.4)
Dermatological visits, n (%)	5 (5.3)	2 (3.1)	8 (12.5)
Patch test done, n (%)	7 (7.4)	6 (9.4)	10 (15.6)
Patch test positive, n (%)	7 (7.4)	6 (9.4)	7 (10.9)
Throat irritation, n (%)	2 (2.1)	1 (1.5)	10 (15.6)*
Rhinitis, n (%)	1 (1.1)	1 (1.5)	3 (4.7)
Cough, n (%)	1 (1.1)	1 (1.5)	8 (12.5)*
Disorders referred to work activities, n (%)	8 (8.4)	6 (9.5)	26 (40.6)*

* $P < 0.05$.

TABLE 3. Comparison of Glove Wearing in Hairdressing Tasks Between Baseline (2006) and Follow-up (2016) Participants

	2006 Hairdressers (n = 95)	2006 Hairdressers (n = 64)	2016 Hairdressers (n = 64)
Use, mean (SD), h/d	2.57 (1.74)	2.6 (1.6)	2.88 (1.93)
Latex gloves, n (%)	67 (70.5)	48 (75)	44 (68.7)
Rubber gloves, n (%)	9 (9.5)	7 (10.1)	4 (6.3)
Polyethylene gloves, n (%)	0	0	0
Vinyl gloves, n (%)	0	0	10 (15.6)
Nitrile gloves, n (%)	0	0	29 (45.3)
Cotton under-gloves, n (%)	3 (3.2)	3 (4.8)	4 (6.3)

throat irritation or cough at the workplace had significantly increased from 2006 to 2016 (2 [2.1%] vs 10 [15.6%], $P < 0.05$) and (1 [1.1%] vs 8 [12.5%], $P < 0.05$), respectively. The occurrence of rhinitis during working hours, conversely, had increased less (by 3.6%), with only 1 (1.1%) of the baseline participants and 3 (4.7%) of the follow-up hairdressers having experienced it. Results showed that hairdressers associated all the disorders mentioned previously with hairdressing tasks significantly more frequently at 10-year follow-up (8 [8.4%] vs 26 [40.6%], $P < 0.05$), with a 23.2% increase from 2006 to 2016. The 3 apprentices involved in the study did not report hand eczema in the first and in the last control, but 2 of them had dryness of the skin and 1 reported throat irritation in the second control.

Glove Wearing in Hairdressing Tasks

The characteristics of glove wearing as personal protective equipment (PPE) at the workplace are reported in Table 3. All hairdressers used gloves during work activities, with a mean (SD) use of 2.6 (1.7) and 2.9 (1.9) hours per day, respectively. Latex gloves were the most commonly used by hairdressers: 67 (70.5%) at baseline and 44 (68.7%) 10 years later. Furthermore, among the 64 hairdressers at follow-up, 4 (6.2%) reported to wear cotton under-gloves; 10 (15.6%), vinyl gloves; and 29 (45.3%), nitrile ones.

Because studied hairdressers mainly used latex gloves, we investigated related symptoms. We found a significant increase in mild symptoms, especially discomfort (2 [2.1%] vs 25 [39.1%], $P < 0.05$), using latex gloves during the follow-up period. No worker, conversely, had shown major conditions such as rhinitis or asthma (Table 4).

TABLE 4. Problems Related to the Use of Latex Gloves at Baseline (2006) and at Follow-up (2016)

	2006 Hairdressers (n = 95)	2006 Hairdressers (n = 64)	2016 Hairdressers (n = 64)
Discomfort, n (%)	2 (2.1)	2 (3.1)	25 (39.1)*
Itching, n (%)	1 (1.1)	1 (1.6)	15 (23.4)
Hives, n (%)	1 (1.1)	0	3 (4.7)
Papules, n (%)	0	0	0
Asthma/rhinitis, n (%)	0	0	0

* $P < 0.05$.

Cutaneous Symptoms in the Last 12 Months

Prevalence of hand skin problems among hairdressers in the 12 months before each questionnaire is reported in Table 5. Cutaneous fissuring, dryness, and itching of the skin for the past 12 months were significantly more prevalent at 10-year follow-up (9 [9.5%] vs 36 [56.2%], $P < 0.05$; 19 [20.0%] vs 24 [37.5%], $P < 0.05$; 8 [8.4%] vs 28 [43.7%], $P < 0.05$), with an increase in frequency of 46.8%, 17.5%, and 35.3%, respectively.

Association Between Contact Dermatitis and Respiratory Symptoms

Table 6 reports factors associated with contact dermatitis investigated using the logistic regression. Atopic eczema in childhood was a strong risk factor but did not reach statistical significance. Age and seniority of work were not relevant. Throat irritation was significantly associated with contact dermatitis with an odds ratio (OR) of 5.7 (95% confidence interval [CI] = 1.2–26.8).

Multivariate Analysis of Factors Associated with Contact Dermatitis During the Follow-up Analyzed Using the Generalized Equation Estimation

Irritant contact dermatitis of the hands during the follow-up period was not related to female sex, age, or work seniority in all of 3 estimated models. To do the hair dyeing is a risk factor, but the association did not reach statistical significance. In addition, the same held for atopic dermatitis, probably because of its low

TABLE 5. Prevalence of Hand Skin Problems Among Hairdressers in the 12 Months Before the Questionnaire

	2006 Hairdressers (n = 95)	2006 Hairdressers (n = 65)	2016 Hairdressers (n = 64)
Dryness, n (%)	19 (20.0)	14 (21.9)	24 (37.5)*
Fissures, n (%)	9 (9.5)	6 (9.4)	36 (56.3)*
Vesicles, n (%)	2 (2.1)	0	5 (7.8)
Desquamation, n (%)	2 (2.1)	1 (1.6)	4 (6.3)
Itching, n (%)	8 (8.4)	5 (7.8)	28 (43.8)*

* $P < 0.05$.

TABLE 6. Factors Associated With Contact Dermatitis in Hairdressers (Women) Investigated Using Logistic Regression

	OR	95% CI	P
Age	0.93	0.79–1.10	0.448
Seniority of work	1.1	0.90–1.26	0.42
Atopic eczema	10.7	0.8–143.0	0.073
Throat irritation	5.7	1.2–26.8	0.029

Bold font indicates statistical significance.

prevalence among study hairdressers. Conversely, dry skin increased the dermatitis risk, reaching statistical significance (OR = 4.2; 95% CI = 1.7–10.7) (Table 7).

DISCUSSION

We investigated the changes in dermatological and respiratory disorders in a fixed cohort of hairdressers in 2006 and 2016 using the prospective method, the best design for establishing relationships between outcome of interest and exposure variables. Previous prospective studies on hairdressers were conducted as shorter follow-up studies compared with ours and related to apprentices.^{6,27,28,33} Moreover, some follow-up studies on hairdressers have been retrospective.^{34–36} Hence, as far as we know, our 10-year prospective study is the longest report on occupational related symptoms in working hairdressers.

Some previous studies performed on fairly small populations of hairdressers investigated selected groups of patients with occupational diseases.^{37–39} Conversely, we considered hairdressers in general, giving a more realistic description of their symptom prevalence. Furthermore, a strength of this study is the high response rate after 10 years (86.3%) because the loss of participants in prospective studies is a well-known problem.⁴⁰ The dropout from the profession (21.9%) is low compared with other studies on hairdressers,^{33,41,42} and the main reasons for leaving are not work related. A particular concern is whether sensitive individuals had already left the trade and were therefore not included in the sample, resulting in a “healthy worker effect”⁴³ because the health of employed people is generally better than that of the unemployed population. Study hairdressers at baseline had

a seniority of work of 15.7 years. Lysdal et al⁴² found that 44.3% of their study population no longer worked as hairdressers and had worked for an average of 8.4 years in the profession before leaving it, with hand eczema as a significant contributor to this career change. A Danish prospective study⁶ reported roughly our same discontinuation rate (21.8%) but for hairdressing apprentices for a 3-year follow-up, with skin diseases and respiratory symptoms as the main reasons for leaving. A retrospective study in Finland⁴¹ found that hairdressers who experienced asthma and hand eczema composed a high-risk group for leaving the profession, with a dropout of 41.2% during a 15-year follow-up period. All these findings support the existence of a “healthy worker survivor effect”⁴³ in hairdressers in relation to both dermatological and respiratory disorders.

In agreement with the literature,^{44,45} more than 80% of the study workforce was female (85.3% at baseline and 90.6% at follow-up). Family history of allergy is a well-documented risk factor for hairdressers to develop occupational contact dermatitis and asthma.^{46,47} The frequency of smokers was higher among baseline hairdressers (35.8% vs 26.6%), with 17 smokers fewer at 10-year follow-up. This may be attributable to an increased awareness of health among hairdressers over time. However, the proportion of smokers in the study hairdressers is higher than in the general population in Italy (22%).⁴⁸ This finding is in line with previous investigations, which reported smoking as more common in hairdressers than in controls.^{26,47,49} We also found a low overall prevalence of personal history of atopic dermatitis and respiratory allergic disorders. Both these findings may suggest the existence of a “healthy worker effect” in the hairdressing trade. Carøe et al,¹⁸ whose study focused on hairdressers with respect to job position, found a significant difference in the prevalence of atopic dermatitis between apprentices and fully trained hairdressers, suggesting that a healthy worker effect is found among the latter group. However, the occurrence of atopic dermatitis in the Italian population is generally lower than that found, for instance, in northern Europe.⁵⁰ In addition, with respect to the few reported cases of asthma, it is well known that asthmatic reactions develop after several years of working in the hairdressing trade.^{8,51}

It should be pointed out that with the exception of manicure treatments, almost all hairdressers at follow-up (>98%) performed typical hairdressing tasks, being therefore exposed to several hazardous agents capable of causing dermatological and respiratory

TABLE 7. Multivariate Analysis of Factors Associated With Irritant Contact Dermatitis on the Hands During the 10-Year Follow-up Period, Using Generalized Equation Estimation

Factors	Model A OR (95% CI)	Model B OR (95% CI)	Model C OR (95% CI)
Female	1.27 (0.39–4.1)	1.3 (0.4–4.3)	1.1 (0.31–3.7)
Age	0.97 (0.9–1.05)	0.98 (0.96–1.05)	0.96 (0.88–1.04)
Length of service	1.0 (0.9–1.09)	1.0 (0.93–1.1)	1.03 (0.95–1.13)
Atopic dermatitis		2.3 (0.1–32.6)	1.6 (0.1–25.4)
Hair dyeing		5.8 (0.6–52.5)	5.8 (0.5–70.1)
Dry skin			4.2 (1.7–10.7)

Bold font indicates $P = 0.001$.

problems. The most common culprits are *p*-phenylenediamine and toluene 2,5-diamine from hair dyes,⁹ ammonium persulfate and hydrogen peroxide from air bleaching products,⁸ and thioglycolates from permanent wave solutions.³ In addition to chemical exposure, hairdressers frequently performed the cleaning of the hairdressing salon (78%). This, together with washing and handling damp hair as well as glove wearing, strongly predisposes hairdressers to the irritant exposure of wet work, which plays a prominent role in inducing dermatologic symptoms.⁵²

At baseline, study hairdressers reported generally low prevalence of both skin and respiratory symptoms. This finding is not in alignment with previous studies, which have found these symptoms to be significantly more prevalent in hairdressers than in other occupational groups and in the general population.^{17,36,42,53} The low prevalence of contact dermatitis at first examination can be related to the low prevalence of these diseases in Italy compared with Nordic countries.⁵⁴ Moreover, the low prevalence of occupational related disorders at baseline can indicate again a healthy worker effect⁴³ in working hairdressers. At 10-year follow-up, the prevalence of contact dermatitis (12.5%) was similar to that found by Kieć-Swirczyńska et al¹⁷ (10%–20%). Surprisingly, the reported use of corticosteroid creams (22.4%) was much higher than the reported cases of dermatitis, suggesting a not always appropriate use of this drug. At baseline, conversely, we found that only 1 in 4 of the symptomatic hairdressers was treated.

With respect to respiratory symptoms, we had a significant increase, especially of throat irritation and cough. The overall prevalence of airway symptoms in our study population (10.9%) was similar to that found by Lysdal et al²³ (11.2%). The increase in respiratory disorders in hairdressers may reflect the intense exposure to irritating airborne chemicals, often in combination with inadequate PPE and ventilation systems in hairdressing salons. In agreement with the literature,^{8,33,35,53} studied hairdressers developed respiratory disorders after several years of working in the hairdressing trade. In addition, at 10-year follow-up, significantly more hairdressers (40.6%) associated all the disorders mentioned previously with hairdressing tasks.

With respect to PPE, all hairdressers used gloves during working hours. However, glove wearing was for approximately only 2 to 3 hours per day, suggesting that hairdressers were exposed to prolonged contact with wet work and chemicals on a daily basis for the 10-year period. Latex gloves were the most commonly used by study hairdressers (70.5% at baseline and 68.7% at follow-up). We found, conversely, a consistently lower use of rubber gloves. It is plausible that such gloves might have been used less because rubber chemicals are well-known allergens capable of causing allergic contact dermatitis in susceptible individuals.^{55,56} Of the hairdressers at follow-up, 45.3% reported wearing nitrile gloves, and 15.6%, vinyl ones. The wearing of such gloves was less than that of latex gloves, even though nitrile and vinyl represent a suitable alternative to latex for both protective efficacy and lower occurrence of allergic adverse effects.^{57,58} Even since introduction of powder-free latex gloves in recent years, latex allergic hypersensitivity is still an important

problem.^{59,60} We investigated latex-related symptoms in our workers, finding significantly raised prevalence of mild cutaneous symptoms, especially of discomfort (39.1%). With respect to major conditions, such as rhinitis or asthma, conversely, we had no such case. However, as previously reported,^{57,61} both a low awareness of latex-related health risks among workers and the fear of losing the job could have led to underestimation of the actual latex-related disorders.

Hand eczema is characterized by symptoms such as skin dryness, fissuring, itching, desquamation, or vesicles,⁶² and each of these symptoms may sound alarm bells in terms of preventive actions and early diagnosis. Hand eczema typically affects manual workers who are exposed to water, detergents, solvents, irritants, and sensitizers, and hairdressing is a high-risk profession.^{10,50,63} Interestingly, we found a significantly increased prevalence of hand skin problems within the past 12 months, especially fissuring (56.2%), dryness (37.5%), and itching (43.7%). The occurrence of hand skin disorders is within the same range as the prevalence of occupational hand eczema among hairdressers found in previous studies.^{15,42,64,65} Our study demonstrated also an association between hand eczema and respiratory symptoms (throat irritation); to the best of our knowledge, there are no other studies that report association between skin and respiratory symptoms in hairdressers. Both symptoms can be simply the effect of 2 ways of exposure (skin and inhalation routes), or they could suggest that hand eczema can be a predisposing factor to respiratory symptoms, as happens for latex exposure.⁵⁴

Finally, a positive correlation between having skin dryness and developing hand eczema was found (OR = 4.2; 95% CI = 1.7–10.7). This finding, showing that dry skin is a significant risk factor for contact dermatitis, is in agreement with previous findings^{66–68} and strongly emphasizes the importance of prevention in the hairdressing trade. Applying hair dye is a risk factor, but the association did not reach statistical significance, and the same held for having atopic eczema history. The lack of a positive correlation with atopic eczema history is inconsistent with results from other studies suggesting that atopic dermatitis is the most important risk factor for contact dermatitis.^{15,65,68} It is possible that our study lacked the power to detect a potential association, because the studied hairdressers contained only a small number of persons with atopic dermatitis history.

It is possible that the preventive program had affected the outcomes, with lower percentages of skin symptoms due to preventive habits adopted; however, our data demonstrated a prevalence and incidence of skin symptoms in our group similar or slightly lower compared with other international studies.^{15,17,42,64,65}

In this 10-year prospective study, we found a significant increase in both respiratory and dermatologic symptoms, especially throat irritation; cough; and fissuring, dry, and itching hand skin. We also found an increase in mild cutaneous symptoms related to the widespread use of latex gloves among study hairdressers. Our results strongly emphasize the importance of prevention in the hairdresser profession. This must include worker information and training to increase awareness of occupational exposures and promotion of

proper preventive measures. Implementation of PPE and adequate ventilation systems, which can minimize both contact and inhalation exposure in hairdressing salons, needs to be carried out. It is important that individuals at risk, especially those with dry skin, adhere to proper skin care during work, using gloves with low irritant and sensitization potential and skin creams⁶⁹ to support skin barrier function against irritants and allergens.

HIGHLIGHTS

- Our long-term follow-up shows that more than one-third of the population studied reported skin and upper respiratory symptoms during work.
- Incidence of irritant contact dermatitis significantly correlated with dryness of the skin at baseline
- Upper respiratory symptoms were associated with skin symptoms.
- More efforts are needed to promote better ventilation of workplaces, use of less irritant and less sensitizing hair products, and use of moisturizers to prevent dry skin.

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