

Hairdressers' occupational skin diseases in the Finnish Register of Occupational Diseases in a period of 14 years

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Abstract

Background: Hairdressers have a high risk of occupational contact dermatitis caused by exposure to wet work and allergens in hairdressing chemicals.

Objectives: To examine the distribution of diagnoses of occupational skin diseases (OSDs) and their main causes in hairdressers based on a national register data on occupational diseases.

Methods: We retrieved cases of recognized OSDs in hairdressers from the Finnish Register of Occupational Diseases (FROD) in years 2005–2018.

Results: During the 14-year period, a total of 290 cases of recognized OSD in hairdressers were registered in the FROD. Allergic contact dermatitis (ACD) was diagnosed in 54%, irritant contact dermatitis in 44%, and contact urticaria (CU) in 5% of them. ACD was most commonly caused by hair dye products and their ingredients (N = 57), persulfates (N = 35), and preservatives (N = 35; mainly isothiazolinones). Acrylates emerged as hairdressers' occupational contact allergens (N = 8) probably due to introduction of structure nails into hair salons. Persulfates was the most common cause of CU.

Conclusions: ACD was the most common OSD in hairdressers. Our analysis confirms that preservatives are important causes of ACD in hairdressers in addition to hair dye products and persulfates. Acrylates emerged as hairdressers' occupational contact allergens, but contact allergy to perming agents remained rare.

KEYWORDS

acrylates, allergic contact dermatitis, contact urticaria, hair dyes, irritant contact dermatitis, occupational contact dermatitis, persulfates, preservatives

1 | INTRODUCTION

Hairdressers have a high risk of occupational skin disease (OSD) caused by abundant wet work and frequent contact with allergens in hairdressing products.^{1,2} Based on the Finnish Register of Occupational Diseases (FROD), the incidence of OSDs in Finnish hairdressers was recently estimated to be 16/10 000 person years.³ To report the distribution of diagnoses of OSDs and their main causes in hairdressers, we analyzed data on recognized cases of hairdressers' OSD registered in the FROD in the years 2005–2018.

2 | METHODS

The FROD is a national register maintained by Finnish Institute of Occupational Health, which comprises data on cases of occupational diseases in Finland. We have previously described the characteristics and manner of data collection of the FROD.⁴ Briefly, the register contains both recognized and suspected cases of occupational diseases determined by private insurance institutions. It comprises data on occupation, type of industry, up to three causes of each occupational disease, and the respective diagnoses.

For the present study, we retrieved data on diagnoses of skin diseases and the reported causes of allergic contact dermatitis (ACD) and contact urticaria (CU) on all recognized cases of hairdressers' OSD registered in the FROD in the years 2005–2018. The occupational codes used to identify the hairdressers in the FROD data are 5141 in the current ISCO-08-based classification (in use since 2011) and 51411 in the earlier ISCO-88-based classification.

Because the causes of OSDs are recorded in the FROD as they were reported, the specificity of the registered causes is variable and may include group-level entries like "hairdressing chemicals," and on the other hand, specific substances such as *p*-phenylenediamine. This limits the possibilities of analyzing individual allergens in detail.

TABLE 1 Hairdressers' occupational skin diseases (OSD) in 14 years (2005–2018) according to the Finnish Register of Occupational Diseases

Diagnosis	Number of cases with the given diagnosis	Percentage of all cases of hairdressers' OSD
Allergic contact dermatitis	157	54
Irritant contact dermatitis	128	44
Contact urticaria	15	5
Unspecified diagnosis	12	4
OSD total	290	

Note: As one case may have up to three different skin diagnoses registered, the numbers of diagnoses add up to more than *n*(OSD total), and the percentages add up to more than 100.

Abbreviation: OSD total, total number of cases.

Instead, to elucidate the most important causes of OSDs in hairdressers, we have classified the registered causes of ACD and CU into allergen groups. The allergen groups we used include "hair dye products and their ingredients," which comprise entries like "hair dyes" and "hair dye ingredients," and individually mentioned ingredients of hair dye products such as *p*-phenylenediamine and toluene-2,5-diamine sulfate, "persulfates" which comprise "hair bleach products," "persulfates," ammonium and potassium persulfate, "preservatives" that comprise "isothiazolinones," formaldehyde, formaldehyde liberators, and other individually mentioned preservatives as well as "preservatives, unspecified," "acrylates" that comprise "methacrylates, unspecified," "acrylates, unspecified," "acrylate glues" and individual acrylate compounds, "perm chemicals" which include "permanent wave solutions," ammonium and glyceryl thioglycolate and "rubber chemicals," which include "rubber chemicals, unspecified" and individual rubber chemicals.

3 | RESULTS

During 2005–2018, a total of 290 cases of recognized OSD in hairdressers were registered in the FROD. The distribution of skin diagnoses is shown in Table 1. ACD was the most common diagnosis as it was recorded in 54% of cases, followed by irritant contact dermatitis (ICD, 44% of cases). CU was diagnosed in 5% of cases.

The most common causes of ACD in hairdressers (Table 2) were hair dye products and their ingredients, which were reported in 36% of cases, followed by persulfates and preservatives (including

TABLE 2 Causes of hairdressers' occupational allergic contact dermatitis (ACD) in 14 years (2005–2018) according to the Finnish Register of Occupational Diseases (*n* = 157)

Cause	Number of ACD cases	% of ACD cases	Percentage of all cases of hairdressers' OSD
Hair dye products and their ingredients	57	36	20
Persulfates	35	22	12
Preservatives, at least one type	35	22	12
Isothiazolinones (MCI, MI)	24	15	8
Formaldehyde and liberators	11	7	4
Other preservatives ^a	3	2	1
Fragrances	12	8	4
Acrylates	8	5	3
Perming chemicals	4	3	1
Coconut fatty acid derivatives	3	2	1
Metals (nickel, cobalt)	3	2	1
Rubber chemicals	2	1	0.7
Ethanolamine	1	0.6	0.3
Colophonium	1	0.6	0.3
Toluene sulfonamide formaldehyde resin	1	0.6	0.3
Unspecified cause	30	19	10

Note: One case may have more than one causative agent recorded.

Abbreviation: OSD, occupational skin disease.

^aParabens, sodium-2-pyridinethiol-1-oxide (sodium omadine), and unspecified preservatives. MCI, methylchloroisothiazolinone; MI, methylisothiazolinone.

TABLE 3 Causes of hairdressers' occupational contact urticaria in 14 years (2005-2018) according to the Finnish register of occupational diseases (n = 15)

Cause	Number of cases
Persulfates	11
Hair dye products and their ingredients	2
Henna	1
Unspecified cause	1

isothiazolinones, formaldehyde and formaldehyde liberators, and other preservatives), both reported in 22% of cases of ACD. Fragrances were also a relatively common cause of ACD, reported in 8% of cases. Acrylates (methacrylates, unspecified acrylates and in one case cyanoacrylate) were a cause in 5% of cases of hairdressers' ACD. In up to 19% of cases with ACD diagnosis, the cause was not specified or was recorded in the register in general terms only, such as the hair-dressing chemicals, which prevents any further analysis. The majority (73%) of CU cases were caused by persulfates, whereas hair dye products and their ingredients were registered as causes in only a few cases of CU (Table 3). The most commonly registered causes of hairdressers' ICD were "hairdressing chemicals" and "wet work."

4 | DISCUSSION

We report on 14-year data from the FROD, a national register on occupational diseases, according to which the most common recognized OSD in hairdressers is ACD, followed by ICD. The most frequently reported causes of hairdressers' ACD include hair dye products, persulfates, and preservatives, mainly isothiazolinones. Persulfates were the main cause of occupational CU in hairdressers.

Hairdressing is among the occupations with the highest risk of occupational hand eczema and CU.³⁻¹⁰ We have previously reported based on the FROD data that the incidence of occupational ACD in Finnish hairdressers is 8.33/10 000 person years,³ and that of CU is 0.91/10 000 person years, whereas the incidence of any OSD was 16/10 000 person years.¹¹ By comparison, a study on Italian hairdressers reported an estimated incidence of contact dermatitis of 18.4 per year on 10 000 workers, and that of occupational contact dermatitis 7.4 per year on 10 000 workers.¹² In the present analysis, ACD was diagnosed in 54%, whereas ICD was diagnosed in 44% of hairdressers with OSD. In a Danish study on hairdressers with occupational contact dermatitis, the share of ICD and ACD was quite equal, as 48.3% were diagnosed with ICD and 46.7% with ACD.¹ The lower share of ICD in our data might be explained by differences between countries in diagnostic criteria of OSD, especially ICD.

Hair dye products and their ingredients were the most commonly registered cause of OSD in hairdressers. They were reported as a cause in 20% of all OSD cases and in 36% of ACD cases in the present study. This is in accordance with the previous findings that hair dye product ingredients such as *p*-phenylenediamine and toluene-2,5-diamine are important contact allergens in hairdressers.¹³⁻¹⁵ In line

with this, a recent study reports the frequency of patch test positivity to *p*-phenylenediamine to be 20.4% among hairdressers with contact dermatitis.¹²

Persulfates (ammonium, potassium, and sodium persulfate) present in hair bleach products are a known cause of CU, rhinitis, and asthma.¹⁶⁻¹⁸ Specific IgE to persulfates has been demonstrated in some patients.¹⁹ Persulfates also comprise an important cause of delayed allergy and ACD in hairdressers, as is reflected by their share 23% of ACD cases in our data. Consistent with this, some earlier studies report similar frequencies of patch test positivity to ammonium persulfate in hairdressers (26% in years 1995-2002 and 22% in 2003-2006),^{20,21} whereas a more recent study on years 2007-2012 found 18.7% of hairdressers with work-related dermatitis to be patch test positive to ammonium persulfate.¹³ On the other hand, a study on Italian hairdressers examined in the years 1998 to 2016 found a slightly lower frequency of patch-test positivity to ammonium persulfate of 13.6%.¹²

Preservatives are an important group of contact allergens in hairdressers according to previous reports and the present study.^{1,13} The observed high frequency of isothiazolinones as causes of hairdressers' ACD likely reflects the recent methyisothiazolinone (MI) contact allergy epidemic, which was largely driven by the frequent use of MI as a preservative in cosmetic products, including hair cosmetics, and the high permitted concentration of MI in these products.^{22,23} After implementation of tight regulation on MI in cosmetic products by the European Union, the incidence of MI contact allergy has decreased in European countries²⁴ and the same trend has been seen in occupational ACD caused by isothiazolinones in Finland.⁴

It is difficult to find reports on exact causes of hairdressers' occupational ACD as most published analyses lack relevance data (occupational/non-occupational) of individual patch test reactions. A study on all cases of occupational contact dermatitis in 2010 in Denmark reported that after hairdressing chemicals (N = 37), biocides (ie preservatives; N = 7) were the second largest causative group for hairdressers' ACD followed by nickel/cobalt (N = 5), rubber additives (N = 4) and perfumes (N = 4).¹ The same causative groups occur in our material in almost the same order; fragrances were more important than metals and rubber additives in our study. In our data, the perming chemicals such as thioglycolates were an infrequent cause of hairdressers' ACD, which is in contrast with a previous observation of re-emergence of thioglycolate allergy.¹³ Interestingly, acrylates emerged in our list in a rather high position with eight occupational ACD cases. These acrylate contact allergies probably did not derive from hairdressing itself, but from application of structure nails in hair salons, as some hairdressers may have taken to the lucrative structure nail work.

Regarding the limitations, as we have previously described, the Finnish statutory insurance system mandatorily covers all employees but is voluntary for those working as entrepreneurs or otherwise on their own, as many of the hairdressers currently do.³ Analyses based on the FROD data might thus underestimate the incidence of OSD in hairdressers. Since the specificity of the registered causes of OSDs is variable in the FROD, the possibilities to analyze individual allergens in detail are limited. In the present report, we therefore have presented the main causes grouped as shown in Tables 2 and 3. As the

registered causes of ICD represent the diagnosing physicians' opinions and perhaps varying perceptions on the exposures in an occupation, the register data does not permit any detailed analysis on causes of ICD. In conclusion, based on a national register data on a period of 14 years, occupational ACD was diagnosed in 54% of hairdressers with OSD, while ICD was diagnosed in 44%, and CU in 5% of them. The main causes of hairdressers' ACD included hair dye products and their ingredients, persulfates and preservatives. Fragrances caused some ACD cases. Acrylates emerged as occupational contact allergens in hairdressers. Perming agents have remained rare causes of ACD in Finnish hairdressers. Rubber chemicals caused even fewer occupational ACD cases than perming agents. Persulfates were clearly the most common cause of CU in hairdressers. Patch tests in hairdressers with suspected OSD should cover not only allergens in the baseline series but also hair dye ingredients and persulfates. In symptoms suggestive of CU in a hairdresser, persulfates should be considered as one of the potential causes.

CONFLICT OF INTEREST

None to be declared by any of the authors.

AUTHOR CONTRIBUTIONS

Maria Pesonen: Conceptualization; data curation; formal analysis; investigation; writing-original draft; writing-review and editing. **Kirsi Koskela:** Conceptualization; data curation; methodology; writing-original draft; writing-review and editing. **Kristiina Aalto-Korte:** Conceptualization; data curation; formal analysis; investigation; methodology; writing-original draft; writing-review and editing.

DATA AVAILABILITY STATEMENT

Author elects to not share data

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