

Predicting occupational allergy in culinary and hairdressing apprentices

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Background	Apprentices are usually exposed to the same workplace agents as qualified professionals. There is therefore a risk of the development of occupational allergy in apprentices exposed to high (HMW-A) and low molecular inhalant allergens (LMW-A).
Aims	To evaluate and compare the occurrence of work-related allergy-like symptoms in apprentices exposed to HMW-A and LMW-A in a culinary and hairdressing school during the first and second year of vocational training.
Methods	We asked culinary and hairdressing apprentices in their first and second year of vocational training to complete a questionnaire about work-related allergy-like symptoms. In first-year apprentices, we undertook spirometry, skin prick tests for occupational allergens and blood tests for allergen-specific Immunoglobulin E (IgE) antibodies.
Results	Hypersensitivity to occupational allergens was more frequent in first-year apprentices exposed to HMW-A compared to LMW-A ($P < 0.05$). Apprentices exposed to LMW-A reported increasing occurrence of skin disorders and upper respiratory tract symptoms between the first and second years of training. First-year apprentices exposed to HMW-A more frequently reported rhino-conjunctivitis and dyspnoea (approximately $P < 0.001$ and $P < 0.05$) and those exposed to LMW-A more often reported skin symptoms ($P < 0.05$).
Conclusions	Periodic skin and respiratory health surveillance for apprentices exposed to LMW-A or HMW-A might help with early identification and management of occupational allergy.
Key words	Apprenticeship; high molecular weight allergens; occupational allergy; vocational training.

Introduction

Apprentices are usually exposed to the same workplace agents as qualified employees. There is therefore a risk of the development of occupational allergy in apprentices exposed to high (HMW-A) and low molecular inhalant allergens (LMW-A). Previous studies have explored the impact of exposure to HMW-A and LMW-A [1–5] on practitioners' health. This study aimed to evaluate and compare the occurrence of work-related allergy-like symptoms in Polish culinary apprentices exposed to HMW-A and hairdressing apprentices exposed to LMW-A during the first and second year of vocational training, and to establish a baseline immunological

profile of hypersensitivity to potential occupational allergens in first-year apprentices.

Methods

We asked 681 first-year apprentices in a vocational school (374 culinary apprentices and 307 hairdressing apprentices) to complete a questionnaire about work-related skin, eye and respiratory allergy-like symptoms. Participation in the study was voluntary. The questionnaire was designed by the authors and previously validated in 50 apprentices. We carried out spirometry (Micro Lab ML 350, Micro Medical Ltd, UK) in 681 apprentices

Key learning points

What is already known about this subject:

- Apprentices exposed to inhaled and contact allergens during vocational training are at risk of developing occupational allergy.
- Early identification of symptoms is crucial in the prevention of sensitization and occupational allergic diseases.
- Establishing baseline immunological status and monitoring symptoms through health surveillance can be helpful in recognizing, preventing and managing the development of occupational sensitization and allergy.

What this study adds:

- Hypersensitivity to occupational allergens was more frequent in first-year apprentices exposed to HMW-A compared to LMW-A.
- Apprentices exposed to LMW-A reported increasing occurrence of skin disorders and upper respiratory tract symptoms between the first and second years of training.
- First-year apprentices exposed to HMW-A more frequently reported rhino-conjunctivitis and dyspnoea and those exposed to LMW-A more often reported skin symptoms.

What impact this may have on practice or policy:

- Periodic skin and respiratory health surveillance for apprentices exposed to LMW-A or HMW-A might help with early identification and management of occupational allergy.
- Ongoing health surveillance for apprentices will help to establish the possible health outcomes of occupational allergen exposure during training.

and skin prick tests (SPTs) for occupational allergens in 670 apprentices. We skin prick tested culinary apprentices for wheat/rye/barley/oat flour and alpha-amylase (HMW-A) and hairdressing apprentices for potassium peroxodisulphate and paraphenylenediamine (LMW-A). From 665 apprentices we collected blood for allergen-specific IgE antibodies (asIgE) assay (ImmunoCap-100 System, Phadia, Sweden or Biomedica, USA) to the following occupational allergens: mixed flours (wheat, rye, rice, barley), an isolated wheat/rye/barley/oat flour or ammonium persulphate, henna, chrome, nickel chloride, formaldehyde and mixed disinfectants (chloramine, formaldehyde, glutaraldehyde, phthalic anhydride). We asked 630 second-year apprentices (the same cohort that was previously questioned) to complete the questionnaire to monitor the development of occupational allergy. The research project was approved by the local Bioethical Committee. We used Fisher's exact test for statistical analysis with a 2×2 contingency table. We considered two-tailed P -value < 0.05 as significant.

Results

The response rate for the questionnaire administered to 681 first-year apprentices was 100%. When the questionnaire was administered to the same students in their second year of training, 590/630 responded (94%). At least one SPT to selected occupational allergens was positive in 9 of 365 (2.5%) first-year apprentices exposed to HMW-A and in 1 of 305 (0.3%) apprentices exposed to LMW-A ($P = 0.02$). Occupational asIgE were detected in 15 (4%) of 367 culinary apprentices and in

5 (2%) of 298 hairdressing apprentices ($P = 0.1$). Two (0.5%) apprentices exposed to HMW-A showed a bronchial obstruction pattern in spirometry [6].

Table 1 shows that apprentices exposed to LMW-A reported increased occurrence of skin disorders and upper respiratory tract symptoms in their second year of training. Table 2 shows that first-year apprentices exposed to HMW-A more frequently reported rhino-conjunctivitis and dyspnoea and those exposed to LMW-A reported skin symptoms. In the 2 years of study follow-up, finally 60 (13%) participants quit training due to 'health problems', and 31 were not willing to participate in the second year of the study.

Discussion

We found evidence of hypersensitivity to occupational allergens more frequently in first-year apprentices exposed to HMW-A compared to LMW-A. Skin symptoms were more frequently reported by apprentices exposed to LMW-A while eye or respiratory symptoms were more common in apprentices exposed to HMW-A.

This was a longitudinal study but it was limited because we were unable to carry out spirometry and immunological assays during the second year of training. Immunological assays are necessary to determine baseline status and helpful in diagnosing occupational allergy, but they are expensive and labour-intensive. The lower number of participants in the second year than the first year may reflect attrition ('melting trend') first and may have biased the results observed in second-year apprentices due to a 'healthy worker effect' because symptomatic

Table 1. Work-related allergic-like symptoms reported by first- and second-year culinary and hairdressing apprentices exposed to high molecular weight allergens (HMW-A) and low molecular weight allergens (LMW-A)

Reported symptoms	First-year apprentices exposed to LMW-A (<i>n</i> = 307), <i>n</i> (%)	Second-year apprentices exposed to LMW-A (<i>n</i> = 216), <i>n</i> (%)	<i>P</i> -value*	OR (95% CI)	RR (95% CI)
Skin	48 (16)	50 (23)	<0.05	0.6 (0.4–1.0)	0.67 (0.5–1.0)
Eye	7 (2)	9 (4)	NS	0.53 (0.2–1.6)	0.55 (0.2–1.4)
Upper airways	13 (4)	20 (9)	<0.05	0.43 (0.2–1.0)	0.46 (0.2–0.9)
Cough	8 (3)	13 (6)	NS	0.42 (0.1–1.1)	0.43 (0.2–1.0)
Dyspnoea	4 (1)	6 (3)	NS	0.46 (0.1–1.9)	0.46 (0.1–1.6)
Reported symptoms	First-year apprentices exposed to HMW-A (<i>n</i> = 374), <i>n</i> (%)	Second-year apprentices exposed to HMW-A (<i>n</i> = 374), <i>n</i> (%)	<i>P</i> -value*	OR (95% CI)	RR (95% CI)
Skin	33 (9)	28 (7)	NS	1.19 (0.7–2.0)	1.18 (0.7–1.9)
Eye	35 (9)	29 (8)	NS	1.2 (0.7–2.0)	1.2 (0.7–1.9)
Upper airways	65 (17)	51 (14)	NS	1.3 (0.8–1.9)	1.27 (0.9–1.8)
Cough	17 (4)	11 (3)	NS	1.57 (0.7–3.4)	1.54 (0.7–3.2)
Dyspnoea	22 (6)	22 (6)	NS	1 (0.5–1.8)	1 (0.6–1.8)

CI, confidence interval; HMW-A/LMW-A, high/low molecular weight allergens; NS, not statistically significant; OR, odds ratio; RR, relative risk.

*Bolded values < 0.05 was considered as a significant.

Table 2. Comparison of symptoms reported by first- and second-year apprentices exposed to low (LMW-A) and high molecular weight allergens (HMW-A)

Reported symptoms	First-year apprentices exposed to LMW-A (<i>n</i> = 307), <i>n</i> (%)	First-year apprentices exposed to HMW-A (<i>n</i> = 374), <i>n</i> (%)	<i>P</i> -value*	OR (95% CI)	RR (95% CI)
Skin	48 (16)	33 (9)	<0.01	1.9 (1–3)	1.8 (1–3)
Eye	7 (2)	35 (9)	<0.01	0.2 (0.1–0.5)	0.2 (0.1–0.5)
Upper airways	13 (4)	65 (17)	<0.01	0.2 (0.1–0.4)	0.2 (0.1–0.4)
Cough	8 (3)	17 (4)	NS	0.6 (0.2–1.3)	0.6 (0.0–1.3)
Dyspnoea	4 (1)	22 (6)	<0.01	0.2 (0.1–0.6)	0.2 (0.07–0.6)
Reported symptoms	Second-year apprentices exposed to LMW-A (<i>n</i> = 216), <i>n</i> (%)	Second-year apprentices exposed to HMW-A (<i>n</i> = 374), <i>n</i> (%)	<i>P</i> -value*	OR (95% CI)	RR (95% CI)
Skin	50 (23)	28 (7)	<0.01	3.7 (2–6)	3 (2–5)
Eye	9 (4)	29 (8)	NS	0.5 (0.2–1)	0.5 (0.3–1)
Upper airways	20 (9)	51 (14)	NS	0.6 (0.4–1)	0.7 (0.4–1)
Cough	13 (6)	11 (3)	NS	2.0 (0.9–5)	2 (0.9–4)
Dyspnoea	6 (2.8)	22 (6)	NS	0.5 (0.2–1)	0.5 (0.2–1)

CI, confidence interval; HMW-A/LMW-A, high/low molecular weight allergens; NS, not statistically significant; OR, odds ratio; RR, relative risk.

*Bolded values < 0.05 was considered as a significant.

apprentices may have been less likely to continue to the second year of their apprenticeship [7]. Similar observations were made in a study of welding apprentices [8], in which almost 29% of participants were lost. A majority quit their apprenticeship which was considered due to possible self-selection out of the vocational training because of welding-related health complaints [8].

It has been previously reported that apprentices exposed to HMW-A and organic dust in bakeries develop airway sensitization to specific allergens in the early years

of training [1,2]. Skin disorders, frequently observed in association with LMW-A exposure, may be due to too many allergens and irritants [9]. Further investigation of sensitization to other food inhalant allergens in more experienced culinary apprentices (e.g. seafood, seeds, spices, vegetables and fruit) is required [10].

Our study was intended for practical application in vocational schools. Our questionnaire may be used as an easily available and cheap tool for occupational allergy screening. Periodic skin and respiratory health surveillance

for apprentices exposed to LMW-A or HMW-A might help with early identification and management of occupational allergy.

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Competing interests

None declared.

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