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Work-related respiratory symptoms in Champagne vineyard workers

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KEY WORDS

Rhinitis; respiratory symptoms; vineyard worker; work-related symptom

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Summary

Background and aim. Vineyard workers (VW) are exposed to various respiratory allergens. The aims of the study were to determine the prevalence of work related respiratory symptoms (WRS) in Champagne VW in France and to analyze the relationships between symptoms, occupational exposure and sensitization profile. **Methods.** VW of Reims area were prospectively recruited between 2007 and 2010. Demographic and occupational characteristics were recorded. Respiratory symptoms were scored for each month of the past year. Results of respiratory functional tests and skin prick tests for common respiratory allergens, grape moulds and vine pollen were recorded. **Results.** 307 subjects were included. The prevalence of WRS was 11%. Compared to subjects with symptoms unrelated to work, subjects with WRS were more frequently sensitized to gramineae (34% vs 18%, $p = 0.05$), described ocular itching (74% vs 37%, $p < 0.001$) and seasonal symptoms (88% vs 69%, $p = 0.03$) mainly during lifting and trellising (57% vs 17%, $p < 0.001$). **Conclusion.** WRS are frequent in Champagne VW and are associated with a sensitization to gramineae and with activities performed close to vine in late spring.

Introduction

Work related (WR) asthma and rhinitis are frequent diseases with a significant morbidity and a social and economic impact. WR asthma represents 10 to 15% of adult asthma, and WR rhinitis is 2 to 4 times more common than asthma (1-4). Farmers are highly exposed to various inhaled agents such as organic or inorganic dust, endotoxin, micro-organisms, pollen, mites, moulds, animal danders and pesticides, inducing rhinitis, asthma, chronic bronchitis, hypersensitivity pneumonitis and organic dust toxic syndrome (5,6). WR respiratory symptoms are frequent in crop farmers (7). Allergic rhinitis and respiratory symptoms in fruit farmers are mainly related to pollen allergy, especially gramineae pollen (6). They can also be related to the use of pesticides (8) or exposure to mites (9,10). A few studies performed in Greece, Spain and South Africa, focused on occupational respiratory and/or skin symptoms among grape

farmers (6,8-9,11-13). However, the results of these studies are highly variable in terms of prevalence and severity of allergic diseases, which might be related to differences in the populations studied, culture practice, weather conditions, species of the grape and environmental exposure.

The aims of the study were to determine the prevalence of work related respiratory symptoms in workers of Champagne vineyard in France and to analyze the relationships between symptoms, occupational exposure and sensitization profile.

Methods

Study population

Champagne vineyard workers from 6 different Champagne vineyards of Reims area, France, were prospectively recruited

from the Department of Occupational Medicine of the Mutualité Sociale Agricole (MSA) between 2007 and 2010.

Ethics Statement

All subjects gave verbal informed consent for this non interventional study, as approved by the Institutional Review Board of the University Hospital of Reims, France.

Questionnaire

Once verbal informed consent was obtained, demographic data, smoking status, medical and occupational history were recorded on a standard form. Patients were asked to score rhinitis symptoms (sneezing, rhinorrhea, nasal obstruction, ocular itching) and pulmonary symptoms (cough, wheezing, dyspnea) from 0 (no symptom) to 4 (very severe symptom) retrospectively for each month of the last 12 months. Rhinitis was defined as the occurrence of two or more nasal symptoms or one nasal symptom and eye symptom (8,14). Occupational activities were precisely described, and their relationships with symptoms were noted. WR symptoms were defined as symptoms present during working hours and improving during evenings, weekends and/or holidays (6).

Allergy and respiratory functional tests

Skin Prick Tests (SPT) were performed by a trained physician on the volar side of the forearm for 9 different allergens: pollens of gramineae, betulaceae, *Artemisia vulgaris*, *Plantago lanceolata*, *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, *Alternaria alternata* (100 IR/ml) and grape mould (*Botrytis cinerea*, 1000 IC/ml) (Stallergenes, Antony, France). Patients included in 2010 were also tested for grape pollen (*Vitis vinifera*, 1/10) (Stallergenes, Antony, France). Histamine (10 mg/ml) and saline were used as controls. A positive SPT was defined as the presence of a mean wheal diameter of 3 mm or more than the negative control (15). Sensitization was defined by a positive skin reaction to one or more allergens.

A forced expiratory volume ratio in one and six second (FEV1/FEV6) was measured for each patient using an expiratory flow meter (PiKo-6®, FERRARIS Respiratory, Hertford, UK) as previously described (16,17).

Statistical Analysis

Quantitative variables are described as mean \pm standard deviation and qualitative data as number and percentage. Comparisons between groups were performed using Student t test, Wilcoxon test, Chi-square test or Fisher exact test, as appropriate. A p-value < 0.05 was considered as statistically significant. Data

analysis was performed using SAS version 9.0 (SAS Inc, Cary, NC, USA).

Results

Subjects characteristics and symptoms

Three hundred and seven subjects from 6 different Champagne vineyards were included. The mean age was 43 ± 9 years, with 78% men and 42% current or former smokers. Patients were drivers (26%), workers (62%) or managers (12%). Patients were sensitized in 36% of the cases: gramineae (13%), betulaceae (9%), artemisia (8%), *D. pteronyssinus* (20%), *Alternaria* (7%) and *Botrytis* (2%).

Thirty-eight percent of subjects described symptoms with a prevalence of rhinitis and pulmonary symptoms of 19% and 8% respectively. Symptoms were seasonal in 75% of subjects. Compared to subjects with no symptoms, subjects with symptoms were more frequently workers (70% vs 57%, $p = 0.03$) and more rarely drivers (17% vs 31%, $p = 0.006$), had a higher rate of sensitization (47% vs 29%, $p = 0.002$) and were more frequently sensitized to pollens of gramineae (23% vs 7%, $p < 0.001$), betulaceae (14% vs 6%, $p = 0.01$), *Plantago lanceolata* (9% vs 1%, $p = 0.0005$) and *D. farinae* (23% vs 10%, $p = 0.002$). Functional respiratory tests results were not associated with symptoms.

The prevalence of sneeze was associated with worker status, smoking history, and sensitization to gramineae, betulaceae and plantago (**table 1**). The prevalence of runny nose was associated with worker history, and activities of desuckering, lifting and trellising. The prevalence of itchy eye was associated with smoking history, sensitization to gramineae and activities of lifting and trellising. The prevalence of cough and wheezing were only associated with smoking history. The severity of rhinitis symptoms was associated with smoking history, activities of lifting and trellising and sensitization to gramineae, betulaceae, plantago and *Artemisia* (not shown). The severity of pulmonary symptoms was associated with sensitization to *D. farinae* but not with respiratory functional tests results (not shown).

Surprisingly, sensitization to botrytis was not associated with the prevalence, the type and the severity of symptoms.

Symptoms related to work

Twenty-nine percent of subjects with symptoms described symptoms related to work. The prevalence of work-related symptoms, rhinitis and respiratory symptoms were 11%, 6% and 3% respectively. Compared to subjects with symptoms unrelated to work ($n = 84$), subjects with work-related symp-

Table 1 - Relationships between demographic, functional, sensitization profile and occupational activities, and rhinitis and pulmonary symptoms.

	Sneeze		Runny nose		Nasal obstruction		Itchy eye		Cough		Wheezing		Dyspnea	
	-	+	-	+	-	+	-	+	-	+	-	+	-	+
n	70	49	54	65	87	32	62	57	99	20	111	8	105	14
Working status														
Worker	61%	82%*	59%	78%*	70%	72%	69%	74%	69%	75%	68%	88%	70%	64%
Smoking history														
Current smoker	51%	39%	54%	40%	45%	70%	58%	33%**	40%	75%**	43%	88%*	44%	64%
Pack-year	10 + 11	5 + 7*	10 + 10	7 + 10	8 + 10	8 + 10	10 + 11	5 + 8**	7 + 10	10 + 9	7 + 10	13 + 9	8 + 10	10 + 11
Functional tests results														
FEV1<80% Th	11%	12%	20%	5%**	11%	13%	13%	11%	12%	10%	12%	13%	13%	0%
FEV1/FEV6<0,7	6%	8%	7%	6%	8%	3%	8%	5%	5%	15%	6%	13%	6%	14%
Sensitization														
Gramineae	16%	33%*	19%	26%	21%	39%	15%	32%*	23%	20%	23%	25%	22%	29%
Betulaceae	7%	24%**	15%	14%	13%	26%	13%	16%	14%	15%	14%	25%	12%	29%
Plantago lanceolata	7%	12%	6%	12%	11%	4%	5%	14%	11%	0%	9%	13%	10%	7%
Occupational activity														
Desuckering	13%	14%	6%	20%*	16%	6%	16%	11%	14%	10%	13%	25%	13%	14%
Lifting / Trellising	24%	35%	19%	37%*	31%	22%	18%	40%**	30%	20%	28%	38%	29%	29%

* < 0.05; ** < 0.01

toms (n = 35) were more frequently women (45% vs 20%, p = 0.005), more frequently sensitized to gramineae (34% vs 18%, p = 0.05) and described more frequently seasonal symptoms (88% vs 69%, p = 0.03) and ocular itching (74% vs 37%, p < 0.001). Working status did not differ between subjects with symptoms related and unrelated to work.

Compared to patients with symptoms unrelated to work, patients with symptoms related to work described more frequently symptoms during the activities of lifting and trellising (57% vs 17%, p < 0.001). Analysis of monthly distribution of symptoms showed that patients with symptoms related to work described symptoms mainly in May and June (**figure 1**).

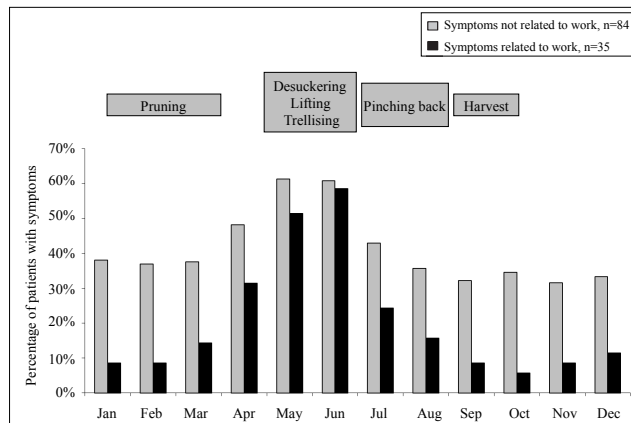
Vine pollen sensitization

To determine if vine pollen sensitization was associated with the high rate of work-related symptoms in the late spring, a sub-population of 76 subjects was tested by SPT with a vine pollen

extract. Eleven subjects (14%) were sensitized to vine pollen (**table 4**). Patients sensitized and not sensitized to vine pollen did not differ in terms of demographic and functional characteristics and working status. Patients sensitized to vine pollen were more frequently co-sensitized to pollens of gramineae (73% vs 15%, p = 0.0002), betulaceae (45% vs 9%, p = 0.007), plantago (36% vs 2%, p = 0.001), artemisia (36% vs 9%, p = 0.03) and to botrytis (27% vs 2%, p = 0.009). We did not find any vine pollen monosensitized worker.

Analysis of symptoms described by patients sensitized and not sensitized to vine pollen did not find any difference in the prevalence of symptoms (63% vs 46% respectively, ns) and work-related symptoms (22% vs 18% respectively, ns), the type or the severity of symptoms (not shown). All 37 subjects with symptoms described symptoms during the activities of desuckering, lifting, trellising and fertilizers use, with no significant difference between patients sensitized and not sensitized to vine pollen.

Figure 1 - Monthly distribution of symptoms related and not related to work.



Discussion

In this study we described for the first time the prevalence of rhinitis and pulmonary symptoms in a large population of Champagne vineyard workers. Subjects were systematically tested for environmental allergens and a subpopulation was tested for vine pollen. We found that the prevalence of WR rhinitis and respiratory symptoms were 6% and 3% respectively, associated with a higher rate of sensitization to gramineae but not to vine pollen and that symptoms occurred mainly in late springs during the activities of lifting and trellising.

In our study, the prevalence of rhinitis and respiratory symptoms were 19% and 8% respectively. These rates were similar to a recent study describing rhinitis in 25% and asthma in 6% of the general French population (14). The prevalence of rhinitis in crop farms is described from 13% to 41% of farmers, symptoms of asthma from 3% to 7%, depending on the studies performed in farmers from different European countries and exposed to different cultures (fruits/vegetables, flowers, grain) (5,6,18,19).

WR symptoms were described by 11% of the subjects in our study: WR rhinitis in 6% and WR pulmonary symptoms in 3% of the subjects. Previous European study described WR symptoms in 25% of fruit farmers (7). Spiewak described occupational sneezing and rhinorrhea in 16% of a population of crop farmers, cough and dyspnea in 9% (20). However, this last study was performed in a farming student population exposed to grain dust. A study comparing grape farmers to a control population in Greece showed that grape farming was a risk factor for occupational sneezing (OR 2.9), rhinorrhea (OR 2.5), cough (OR 3.7), and dyspnea (OR 3.8) (6).

Interestingly, smoking history was associated with the prevalence and the severity of sneeze, itchy eye, cough and wheezing in our study. Cigarette smoke is known as an air pollutant

triggering airway inflammation and increasing the severity of asthma and rhinitis (21). The prevalence of smokers in our study was 42%, higher than French general population (33% in 2006) (22) but similar to previous studies performed in European crop farmers (5,19).

The rate of sensitizations in our study in the whole population was similar to previous study (23). Interestingly, we found an association between the prevalence and the severity of symptoms and sensitization to pollens and mites, but not to botrytis. A sensitization to vine pollen was found in 14% of subjects in our study, whereas a previous study focusing on workers handling grapes found a prevalence of 3.7% (13). In a case report, Feo Brito *et al* clearly demonstrated immunologic sensitization and respiratory allergy to vine pollen by SPT, specific IgE level and provocation test (11). Interestingly, we found frequent co-sensitization with other pollens and botrytis. However, we did not find any association between vine pollen sensitization and the prevalence or the severity of occupational symptoms. Other occupational allergens have been described in vineyard workers or crop farmers: *Diphotaxis erucoides* in vineyard (11), spider mite (*Tetranychus urticae* and *Tetranychus macdanieli*) in grape farms (9,24) and citrus red mite (*Panonychus citri*) in citrus farms (10). Moreover, pesticide use has been shown to be associated with a higher rate of allergic rhinitis symptoms in grape farmers (8). We did not precisely evaluate the impact of pesticides or fertilizer use on rhinitis or respiratory symptoms in our study.

Interestingly, symptoms were associated with occupational activities performed manually close to vine during the late spring: desuckering, lifting and trellising. Desuckering is performed in mid-May and consists in removing any non-fruitful shoots to encourage the vine to focus its energies on the fruit-bearing shoots. Lifting is performed at the end of May and consists in raising the shoots from the ground and attaching them vertically above the main support wires, giving the vines their architecture and making it easier for operators to do their work. Trellising, performed in June, consists in separating the shoots and stapling them to wires in order to allow maximum light penetration and air circulation that prevents rot. These activities are performed during gramineae pollination (June - July) and vine pollination (first 15 days of June).

Conclusion

In summary, we showed that WR symptoms were frequent in Champagne WV, occurring more frequently in women and associated with sensitization to gramineae and with activities of lifting and trellising performed close to vine in late spring. Based on our results, a closer monitoring of such workers could be proposed, including functional respiratory tests, especially in case of pulmonary symptoms (cough, wheezing or dyspnea), and skin prick tests with pollens extracts of gramineae, betula-

ceae and herbaceae (vine pollen is not commercially available), mites and moulds extracts (*alternaria*, *botrytis*). Such a monitoring could help to reduce the impact of symptoms on work and leisure.

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