Work-Related Asthma-Like Symptoms Among Florists*

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Objectives: **In this study, we evaluated the prevalence of work-related asthma-like symptoms and possible risk factors among florists in Turkey.**
Methods: **We collected questionnaire data from 128 florists, and investigated occupational history and respiratory, ocular, dermal, and nasal symptoms. We evaluated pulmonary function tests with spirometry and atopy by using the skin-prick test. Possible risk factors were analyzed by age-adjusted, smoking-adjusted, and gender-adjusted logistic regression models comparing symptomatic and asymptomatic individuals.**
Results: **The prevalence of work-related asthma-like symptoms was 14.1% (18 patients). We observed excess risk with a high work intensity (odds ratio [OR], 7.3; 95% confidence interval [CI], 1.1 to 51.8) and long work duration (OR, 5.1; 95% CI, 1.2 to 21.6). Florists with work-related asthma-like symptoms were 5.9 times more likely (95% CI, 1.4 to 24.3) to have a positive skin test response to a flower mix allergen. We also observed an excess risk for work-related asthma-like symptoms among those with allergic rhinitis (OR, 13.2; 95% CI, 3.1 to 56.4) and conjunctivitis (OR, 8.4; 95% CI, 2.4 to 29.2).**
Conclusion: **The most prominent risk factors in florists were work intensity, work duration, and specific atopy.** ***(CHEST 2004; 125:2336–2339)***

Key words: asthma; atopy; flower; occupation; work intensity

Abbreviation: ATS = American Thoracic Society

"Look like the innocent flower, but be the serpent under't." William Shakespeare described flowers as innocent in Macbeth, but they are not. Several flowers have been shown to be potent sources of allergens and can cause clinical disease and increase symptoms in 80% of patients with asthma or allergic rhinitis.[1,2]

In the floral industry, there are various potential allergens. Case reports of occupational allergic dermatitis have been published frequently.[3–5] There are only a few studies,[3,4,6,7] mostly case reports, on occupational respiratory diseases caused by flowers. There are also some studies[8–10] on the prevalence of occupational respiratory diseases in this industry, however, study groups included flower growers and greenhouse workers only. Respiratory symptoms are caused by various flowers, such as freesia, chrysanthemum, tulip, narcissus, baby's breath, rose hip, sunflower, and mimosa.[1,4–6,11] One study[12] reported asthma and allergy symptoms among rose production farmers in Turkey.

To our knowledge, this study is the first to evaluate the prevalence of work-related asthma-like symptoms among florists working in floral shops. In a population-based cross-sectional study, we evaluated the prevalence of work-related asthma-like symptoms and sensitization to workplace allergens among florists in western Turkey.

Materials and Methods

This study was conducted between January and February 1999 in Izmir, the third largest city in Turkey, which is located on the western shore. A study population was selected from 69 floral shops in three main districts. Nine shops were excluded because three were closed at two different scheduled visits and six others refused to participate. Data were collected from 60 floral shops with a total of 159 workers, of whom 128 (80.5%) agreed to participate in the study. All data, including questionnaire data, were collected by an experienced pulmonologist. Demographic data, allergic and respiratory symptoms, family and personal history of respiratory and allergic diseases, medication, smoking and occupational history, including work duration and intensity, were collected by modified American Thoracic Society (ATS) questionnaire work-site personal interviews.[13] At each shop, area,

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humidity, and temperature (Met-Check; Milton Keynes, UK) were measured near the end of the work shift on the day of our visit. Participant florists were asked whether they had an effective local exhaust ventilation system that was operational during working hours in their shops. If they had a ventilation system, the interviewer confirmed that the system was working. Based on the distribution of area measurements, shops with an area of ≥ 100 m^2 were categorized as large shops, and they were compared with medium size (area, 51 to 99 m^2) and small shops (area, ≤ 50 m^2). Work intensity was calculated from the daily work hours multiplied by the work duration (hours $\times$ years). Florists were categorized into a low-work-intensity group (< 35), medium-work-intensity group (35 to 167), or high-work-intensity group (≥ 168).

Atopy for the most common allergens in the region (*ie*, *Dermatophagoides farinae*, *Dermatophagoides pteronyssinus*, and mold mix)[14] and for a commonly used flower mix (*ie*, *Aster chinensis*, *Chrysanthemum koreanum*, *Dahlia cultorum*, *Solidago virgaurea*, and *Chrysanthemum leucanthemum*) were evaluated by skin-prick test (Stallergenes-Pasteur; Antony, France). We measured the largest wheal diameters 15 min after application. A wheal ≥ 5 mm larger than the control, from any of the four antigens, was considered to be atopy-positive.[15] Work-site pulmonary function tests (*ie*, FEV_1, FVC, FEV_1/FVC ratio, and peak expiratory flow) were collected from each florist with a spirometer (Micro Medical; Kent, UK) using methods that adhered to techniques recommended by the ATS.[16] For predicted spirometry values, we used Knudson predictive equations.[17] We selected the largest FVC and FEV_1 values for evaluation.

Based on the ATS Division of Lung Diseases 78-item questionnaire, florists were asked in questions 7, 8, 9, 10, 11, 12, and 13 whether they had any one of the following recurrent symptoms: nonproductive cough, dyspnea; chest tightness; or wheezing.[13] By asking standard questions, we collected the following information: Did these symptoms begin and exist within the overall working period as a florist? Were symptoms related to work? Did symptoms improve when the person was away from work? We did not confirm the asthma diagnosis by using further clinical tools. Specific symptoms for conjunctivitis, rhinitis, and dermatitis also were asked.

Using a statistical software package (SPSS, version 11.01; SPSS; Chicago, IL), we evaluated occupational risk factors by age-adjusted, smoking-adjusted (in pack·years), and gender-adjusted unconditional logistic regression models comparing symptomatic and asymptomatic florists. Humidity and temperature did not change the results, so we did not include these variables in the analysis. Florists who reported asthma-like symptoms that were not work-related (21 florists) also were excluded from logistic regression analysis.

Results

The median age of florists was 28.0 years (age range, 12 to 66 years), and $> 50\%$ had worked as a florist for ≥ 10 years. The distribution of florists by possible occupational risk factors is presented in Table 1. All of the spirometry tests, including FEV_1 (median, 87.4% predicted) and FEV_1/FVC (median, 94.9% predicted) were within the normal ranges, and there was no significant relationship between FEV_1 values and symptoms. Twenty-one florists reported symptoms that were consistent with asthma. The prevalence of work-related asthma-like symptoms among florists was 14.1% (18 florists; nonproductive cough, 7.8% [10 florists]; dyspnea, 7.8% [10 florists]; chest tightness 3.9% [5 florists], and wheezing 4.7% [6 florists]). The age, gender, and smoking distribution of those with work-related asthma-like symptoms did not differ from those without symptoms. We also observed 18 cases of conjunctivitis (14.1%), 17 cases of rhinitis (13.3%), and 29 cases of dermatitis (22.7%) among florists.

Table 1—*Distribution of Possible Risk Factors for Work-Related Asthma-Like Symptoms in Florists*

Risk Factors	No. (n = 128)	%
Male gender	110	85.9
Current smoker	81	63.3
Personal history of respiratory and allergic problems	28	21.9
Family history of respiratory and allergic problems	31	24.2
Work intensity		
Low (≤ 35)	38	29.7
Medium (36–167)	47	36.7
High (≥ 168)	43	33.6
Work duration, yr		
< 1	12	9.4
1–9	51	39.8
≥ 10	65	50.8
Work area size, m^2		
≥ 100	30	65.6
51–99	14	10.9
≤ 50	84	23.4
Ventilation system present	78	60.9
Temperature ≥ 19°C	84	65.5
Humidity $\geq 58\%$	64	50
Atopy		
General allergen	11	8.6
Flower mix	12	9.4

The age-adjusted, smoking-adjusted, and gender-adjusted risk for work-related asthma-like symptoms was 7.3 times higher among florists in the high-work-intensity group than among those in the low-work-intensity group (Table 2). Small work area size (*ie*, ≤ 50 m^2) was an important risk factor. We observed excess risk for work-related asthma-like symptoms among florists who had been working for > 10 years. Florists with positive allergen skin test responses to the flower mix were 5.9 times more likely to have work-related asthma-like symptoms. We also observed an excess risk of work-related asthma-like symptoms among workers with allergic conjunctivitis and rhinitis.

Discussion

In this study, the prevalence of work-related asthma-like symptoms among florists was 14.1%, and the most prominent risk factors were work intensity, work duration, workplace size, atopy, and family

Table 2—*Factors Associated With Work-Related Asthma-Like Symptoms in Florists

Risk Factors	Symptoms, No. Yes	Symptoms, No. No	OR (95% CI)†
Work intensity			
Low (≤ 35)	2	31	1.00‡
Medium (36–167)	9	31	5.9 (1.0–32.9)
High (≥ 168)	7	27	7.3 (1.1–51.8)
Work area size, m^2			
≥ 100	2	20	1.00‡
51–99	5	7	1.7 (0.3–8.6)
≤ 50	11	62	7.1 (1.1–48.3)
Work duration, yr			
< 10	5	47	1.00‡
≥ 10	13	42	5.1 (1.2–21.6)
Atopy			
General allergen	2	7	1.3 (0.2–7.3)
Flower mix	5	6	5.9 (1.4–24.3)
Conjunctivitis	8	8	8.4 (2.4–29.2)
Rhinitis	8	7	13.2 (3.1–56.4)
Dermatitis	6	17	1.9 (0.6–6.0)
Personal history of respiratory or allergic problems	6	14	2.6 (0.8–8.4)
Family history of respiratory or allergic problems	9	16	5.1 (1.6–16.3)
No ventilation	10	52	1.1 (0.4–3.1)
Temperature ≥ 19°C	6	32	0.8 (0.3–2.6)
Humidity ≥ 58%	10	42	1.5 (0.5–4.2)

*Florists with non-work-related asthma (n = 21) were excluded from the study.

†Analysis adjusted for age, smoking, and gender. OR = odds ratio; CI = confidence interval.

‡Reference value.

history of respiratory and allergic problems. To our knowledge, this study is the first to evaluate the prevalence of work-related asthma-like symptoms in florists.

The European Farmers study[18] reported a 3.2% asthma prevalence for crop farmers. However, analysis by specific crops showed a higher prevalence of asthma (5.1%) in flower and/or ornamental plant growers. Another study[10] performed nonspecific bronchial provocation challenge tests and reported a nearly 8% prevalence of asthma in greenhouse flower and ornamental plant growers. We found a relatively high prevalence of work-related asthma-like symptoms in florists, possibly due to different working conditions between florists and flower growers. We did not observe any airways obstruction by spirometry. This may be explained by participants using asthma medications, however, we did not receive useful medication information from most of the study participants. Another plausible explanation for not seeing obstruction is that a single spirometry measurement is usually normal in asthma patients.

Turkish florists tend to start working at a very early age, commonly before adolescence. About half of the study population were smokers, which is similar to the overall smoking rate in Turkey.[19] The age, gender, and smoking habits of the asthmatic florists were similar to those without asthma symptoms.

The most apparent risk factor for work-related asthma-like symptoms among florists was work intensity, which reflects occupational exposure. Few occupational asthma studies have addressed work intensity.[20,21] Finding a positive dose-response relationship between work intensity and work-related symptoms has supported the accuracy of our questionnaire-based asthma diagnosis. Work duration and workplace size also were associated with the risk of work-related asthma-like symptoms. We did not find any relationship between the one-time measurement of workplace temperature or humidity and work-related asthma. Another study[10] concluded that the concentration of workplace air contaminants was not the primary determinant of sensitization to greenhouse allergens in flower growers.

Studies showed that atopy for high-molecular-weight agents is an important risk factor for work-related asthma.[22] Goldberg et al[8] reported that the incidence of positive skin-prick test responses to ornamental plants was 17 to 23% among the general population, but was 52% among flower growers. Monso et al[10] reported a 21% prevalence of sensitization to cultivated flowers in greenhouse growers. We observed a 9.4% atopic reaction to the flower mix. We did not see any relationship between general allergens and occupational asthma in florists, however, flower mix allergy was an important risk factor for occupational asthma. Previous studies[9,23] have found a high prevalence of rhinitis and conjunctivitis in greenhouse workers. In this study, allergic rhinitis and conjunctivitis were associated with occupational asthma but not with allergic dermatitis, which may be explained by immunopathologic mechanisms.

The high participation rate from small and geographically scattered workshops is the main strength of this study. A limitation of this study is the absence of further diagnostic techniques. Financial limitations precluded their being carried out. Therefore, we could not prove a diagnosis of asthma among florists. We did not collect samples to measure exposure levels, however, we do not think that exposure differences would be a significant factor between workshops. Lack of a control group, cross-sectional design, and possible "healthy worker effect" are other limitations that readers should consider while interpreting our results.

In conclusion, this study identified important risks for work-related asthma-like symptoms among florists. It is known that a reduction in workplace

allergen exposures would reduce the risk of work-related asthma. We related this risk to work intensity, work duration, workplace size, and atopy. Effective ventilation systems, adequately sized working areas, and informing workers about these risk factors also may help to solve the problem.

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