

Original Article

Work-Related Symptoms of Spice Shop Workers and the Effect of Common Aeroallergen Sensitivity on Work-Related Symptoms

Ömür Güngör¹, Nazan Akel², Ceyda Şahan³, Ahmet Uğur Demir⁴, Ali Fuat Kalyoncu⁵

¹Department of Occupational Medicine, Hacettepe University Faculty of Medicine, Ankara, Türkiye

²Department of Occupational Medicine, Mehmet Akif İnan Training And Research Hospital, Şanlıurfa, Türkiye

³Department of Occupational Medicine, Dokuz Eylül University Faculty of Medicine, İzmir, Türkiye

⁴Department of Chest Diseases, Hacettepe University Faculty of Medicine, Ankara, Türkiye

⁵Division of Allergy and Clinical Immunology, Department of Chest Diseases, Hacettepe University Faculty of Medicine, Ankara, Türkiye

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Abstract

OBJECTIVE: Spices, because of their bioactive content, can cause irritation and allergic symptoms in the respiratory system and skin. Spice shop workers are constantly exposed to spices and dried herbs as part of their jobs. This study aimed to investigate the work-related symptoms of spice shop workers. Another aim was to assess the risk status of having an atopic nature for work-related symptoms.

MATERIAL AND METHODS: This was a cross-sectional study. Our research team visited the spice shops and a questionnaire was administered to 112 workers to assess work-related symptoms. In order to determine atopy, 79 of them had skin prick tests with common aeroallergens.

RESULTS: Workers had eye complaints (19.6%), runny noses (22.3%), skin symptoms (9.8%), shortness of breath (9.8%), and coughs (19.6%) at work. The prevalence of atopy was 18%. Atopy was associated with work-related eye complaints (odds ratio (OR): 4.12, 95% CI: 1.17-14.46), work-related runny nose, and work-related cough (OR: 4.85, 95% CI: 1.44-16.32, and OR: 4.41, 95% CI: 1.30-14.97).

CONCLUSIONS: The workers in spice shops are adversely affected by spices and dried herbs in their working environment. Being sensitive to common aeroallergens poses a risk for occupational symptoms.

KEYWORDS: Spices, herbs, occupational exposure, spice shop, atopy

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INTRODUCTION

Spices are natural aromatic substances obtained by drying, grinding, or processing plant components of various plants, such as seeds, leaves, roots, bark, flower buds, or fruits. Since ancient times, spices have been used to flavor foods and beverages. Herbs are plants in which the leafy, green, or flowering parts are medicinal. In recent times, there has been a widespread use of herbal treatment methods.¹ Medicinal plants and spices are usually purchased from spice shops, which are establishments where spices and dried herbs are sold in residential areas. Spice shop workers not only ensure that products reach customers, but also provide information about spices and other related products. They also perform a number of tasks that facilitate the overall shopping experience. The process of delivering products to customers causes the dispersion of particles and the release of suspended particles, thus creating an environment that poses as an occupational hazard in stores.

Spices contain irritants and pharmacologically active ingredients that can stimulate the immune system's response.² Occupational inhalation of spices and skin contact can cause certain symptoms. Zuskin et al³ revealed the immunological and irritant properties of spices on workers. Exposure was associated with acute respiratory symptoms and alterations in lung function.³ In addition, there have been documented reports of allergy symptoms in farmers who come into contact with plants due to their occupation.⁴

Spice allergies often occur following an initial sensitization to other allergens.² Cross-reactivity to protein allergens appears to be an important trigger for the activation of allergic reactions to spices.² The cross-reaction of spices with other spices, pollen, and some foods can cause allergic symptoms in people.⁵ The most widely recognized cross-reaction is the celery–mugwort–spice syndrome, which is an allergic sensitivity to the Apiaceae family.⁶ The existence of similar immunogens or common epitopes tends to cause cross-reactivity, which exacerbates clinical sensitivity.

Corresponding author: Ömür Güngör, e-mail: omurgungor70@hotmail.com.tr

Atopy is an immunological predisposition that can result in an exaggerated immunoglobulin E response to various allergens.⁷ The global prevalence of atopic diseases has increased in recent years.⁸ Assessing the feasibility of employment for individuals with atopic conditions, in a workplace that contains a high concentration of possible allergens, is a significant concern. There are limited studies examining the impact of workplace exposure to common aeroallergens on susceptible individuals. The study primarily aims to investigate the impact of exposure to spices and dried herbs in the workplace on the eyes, respiratory tract, and skin of spice shop workers. The secondary aim is to evaluate whether having a sensitivity to common aeroallergens poses a risk of exposure to spices and dried herb powders in the workplace.

MATERIAL AND METHODS

Study Design and Population

This is a cross-sectional epidemiological study. A total of 112 currently employed spice shop workers from Spice Bazaar, Grand Bazaar in Istanbul, and Ankara spice shops were included. All participants affiliated with the association were included in the study, and all of them completed the survey. Only 79 of the participants agreed to have a skin prick test (SPT). Beforehand, consent forms were signed separately for both the questionnaire and the SPT. The study obtained ethical approval from the Hacettepe University Faculty of Medicine (approval number: 1609/2021, date: September 7, 2021).

The questionnaire was developed by the authors. It had 2 sections and was administered to the participants face-to-face by the researchers. The participants' demographic characteristics, such as age, gender, and smoking status, were collected in the first section. In the second section, the questions related to occupational characteristics and symptoms. Work-related symptoms resulting from exposure to spice dust in the workplace were defined as work-related eye symptoms (watery, red, and itchy eyes), work-related runny nose symptoms (sneezy, runny, and itchy nose), and work-related skin symptoms (itching and redness on the skin). Work-related shortness of breath and cough were defined as the presence of symptoms associated with spice dust inhalation during work. The SPT was conducted using the 3 common aeroallergens identified in a previous study.⁹ The aeroallergens were pollen (*Phleum pratense*), which is the most common cause of sensitization in the region; the most common mite (*Dermatophagoides pteronyssinus*); and the allergen of cats (*Felis domesticus*), which is the most common pet in Türkiye (ALK-Abello' A/S, Horsholm, Denmark). The test was read

after 15 minutes, and positive results were traced on a clear tape. A mean wheal diameter of 3 mm or more compared to the negative control was considered positive. Atopy was defined as having at least 1 positive sensitivity to one or more common aeroallergens.

Statistical Analysis

The analysis was conducted using the statistical package the Statistical Package for the Social Sciences 23.0 for Windows (IBM Corp., Armonk, NY, USA). The chi-square test was performed to determine the percentages of participants in the different groups. The univariate logistic regression analysis was used to examine the correlation between the characteristics and symptoms of atopic and non-atopic workers. Considering that age, gender, smoking habits, and the presence of asthma might affect the symptoms, adjusted odds ratios were calculated using multivariable logistic regression analysis. A *P*-value less than .05 was considered statistically significant.

RESULTS

The mean age of the workers was 38.13 years and 14% were women. The mean duration of employment was 10.38 years. Non-smokers accounted for 42.9%, ex-smokers 11.6%, and current smokers 45.5%. There were 5 (4.5%) workers with physician-diagnosed asthma and 6 (5.4%) workers with any physician-diagnosed skin disease. Of these, 4 had rosacea, and 1 of them had psoriasis and alopecia areata. Atopy history in the parents (asthma, allergic rhinitis, or a dermatological disease) was present in 15 (13.4%) of the workers. In addition to the spices and herbs they sell in the shop, 12 (10.7%) workers were selling the herbs they had collected. The runny nose (*n* = 25, 22.3%) and eye symptoms (*n* = 22, 19.6%) were the most common work-related symptoms. Work-related skin symptoms and work-related shortness of breath had the same prevalence of 9.8% (*n* = 11). Of the 112 workers, 19.6% (*n* = 22) reported work-related coughing. There was no mold or dampness in any of the workplace environments. There were no complaints of noise exposure in the workplace. The detailed distribution of the characteristic features is shown in Table 1. Of the 79 workers who underwent SPT, 14 (18%) tested positive. The overall positive rates for *Phleum pratense*, *Dermatophagoides pteronyssinus*, and *Felis domesticus* were 13.9% (11), 6.3% (5), and 2.5% (2), respectively.

A univariate logistic regression analysis was performed to assess the risk status of individuals with atopic structures in relation to occupational symptoms. The presence of atopy was associated with work-related eye symptoms (odds ratio (OR): 4.12, 95% CI: 1.17-14.46) and work-related runny nose (OR: 4.85, 95% CI: 1.44-16.32). Simultaneously, workers with atopy were more susceptible to work-related cough (OR: 4.41, 95% CI: 1.30-14.97). There was no statistically significant association observed between atopy and work-related shortness of breath (OR: 2.26, 95% CI: 0.50-10.11). There was no significant association between atopy and work-related skin symptoms (OR: 2.68, 95% CI: 0.58-12.36). When non-smokers were used as the reference group, there was no statistical difference in smoking habits between workers with and without atopy (ex-smokers, OR: 1.38, 95%

Main Points

- Studies in the field of occupational health have mostly examined work-related exposure factors. However, sensitivity to common aeroallergens might significantly impact one's job comfort.
- The allergens and irritants found in spices and dry herbs have a negative impact on atopic workers in spice shops.
- In allergen-dense work environments, identifying workers sensitive to common aeroallergens and providing protective measures will have a positive impact on work health.

Table 1. Characteristics of Participants

(%)	Skin Prick Test Performed	Skin Prick Test Non-Performed	All Participants
	n = 79	n = 33	n = 112
Age (mean $\pm$ SD)	40.17 $\pm$ 10.57	33.24 $\pm$ 10.57	38.13 $\pm$ 10.38
BMI (mean $\pm$ SD)	26.40 $\pm$ 3.85	25.66 $\pm$ 4.13	26.16 $\pm$ 3.93
Gender (female)	13 (16.4)	3 (9.0)	16 (14.3)
Smoking habits			
Nonsmoker	32 (40.5)	16 (48.5)	48 (42.9)
Ex-smoker	8 (10.1)	5 (15.2)	13 (11.6)
Current smoker	39 (49.4)	12 (36.4)	51 (45.5)
Physician-diagnosed asthma	4 (5.0)	1 (3.0)	5 (4.5)
Physician-diagnosed skin disease	6 (7.5)	-	6 (5.4)
Atopy history in the parents	9 (11.3)	6 (18.1)	15 (13.4)
Working years in a spice shop (mean $\pm$ SD)	11.72 $\pm$ 7.55	7.15 $\pm$ 4.79	10.38 $\pm$ 7.15
Symptoms in the workplace			
Work-related eye symptoms	16 (20.2)	6 (18.1)	22 (19.6)
Work-related runny nose	22 (27.8)	3 (9.0)	25 (22.3)
Work-related skin symptoms	9 (11.3)	2 (6.0)	11 (9.8)
Work-related shortness of breath	10 (12.7)	1 (3.0)	11 (9.8)
Work-related cough	19 (24.0)	3 (9.0)	22 (19.6)
Worker who collects some medicinal herbs from the field	8 (10.1)	4 (12.1)	12 (10.7)

CI: 0.12-15.36; current smokers, OR: 3.33, 95% CI: 0.83-13.37). Atopy did not differ significantly by gender (OR: 2.48, 95% CI: 0.64-9.66) and was not different among those who collected plants (OR: 0.63, 95% CI: 0.07-5.63). The mean duration of employment in a spice shop was shorter

for participants with atopy (9.09 years) than for those without atopy (12.29 years), although the difference was not statistically significant (OR: 0.93, 95% CI: 0.85-1.02). Table 2 provides comprehensive comparisons between workers with and without atopy.

Table 2. Comparison of Atopic and Non-Atopic Groups in Spice Shop Workers

n = 79 (%)	Non-Atopic Group n = 65 (82)	Atopic Group n = 14 (18)	Odds Ratio (95% CI)	P
Gender (female)	9 (13.8)	4 (28.6)	2.48 (0.64-9.66)	.23
Smoking habits				
Ex-smoker	7 (10.8)	1 (7.1)	1.38 (0.12-15.36)	.79
Current smoker	29 (44.6)	10 (71.4)	3.33 (0.83-13.37)	.08
Working years in a spice shop (mean $\pm$ SD)	12.29 $\pm$ 7.87	9.07 $\pm$ 5.29	0.93 (0.85-1.02)	.15 ^b
Symptoms in the workplace				
Work-related eye symptoms	10 (15.4)	6 (42.9)	4.12 (1.17-14.46)	.03*
Work-related runny nose	14 (21.5)	8 (57.1)	4.85 (1.44-16.32)	.01*
Work-related skin symptoms	6 (9.2)	3 (21.4)	2.68 (0.58-12.36)	.19
Work-related shortness of breath	7 (10.8)	3 (21.4)	2.26 (0.50-10.11)	.28
Work-related cough	12 (18.5)	7 (50.0)	4.41 (1.30-14.97)	.02*
Worker who collects some medicinal herbs from the field	7 (10.8)	1 (7.1)	0.63 (0.07-5.63)	.98

Atopy was defined as a positive skin prick test for common inhalant allergens.

Odds ratio implies the probability of the first column for atopic workers.

^bOdds ratio implies the probability of the atopy.

*P-value <.05 significant.

Table 3. Association of Symptoms and Atopy by Multivariate Analysis

	Odds Ratio (95% CI)*
Work-related eye symptoms	4.48 (1.18-16.96)
Work-related runny nose	4.53 (1.29-15.90)
Work-related cough	5.39 (1.09-26.77)

Odds ratio implies the probability of the symptoms.

Atopy was defined as a positive skin prick test for common inhalant allergens.

*Adjusted by age, gender, smoking, and asthma.

Significant symptoms were adjusted for confounders using multivariable logistic regression. The presence of asthma and smoking were important confounders for symptoms. While a positive trend was observed for work-related cough (OR 5.39, 95% CI 1.09-26.77), work-related eye symptoms (OR 4.48, 95% CI 1.18-16.96), and runny nose (OR 4.53, 95% CI 1.29-15.90) exhibited almost similar rates (Table 3).

DISCUSSION

Sensitivity to aeroallergens refers to a person's tendency to have a hypersensitive reaction to certain compounds present in the surrounding air. We conducted a study to examine the impact of allergenic plant particles on workers who are susceptible to common aeroallergens in their work environment. We found that atopic workers are predisposed to work-related nose, cough, and eye complaints. We did not find a relationship between work-related shortness of breath and atopy. The prevalence of atopy was 18% and this was found to be 8% lower than that in a study (26%) conducted in the different regions of Türkiye.¹⁰ The reason for this is that workers with atopy may have quit their jobs as a result of the "healthy worker effect." We hypothesize that workers with atopy, in particular, may be forced to quit their jobs due to complaints of work-related shortness of breath. Workers may have ignored cough, nose, and eye symptoms. The present study was cross-sectional, and only those employed at the time of the study were included. This phenomenon can be further investigated with a larger study population, including those who have left work. The majority of studies conducted in the spice industry have focused on investigating the sensitization effects of only 1 or 2 spice kinds.^{5,11,12,13} In addition to aeroallergens, we considered using spices and dried herbs for skin testing in our study. Compared to spice factories, our study population has been exposed to a much wider variety of spices and herbs. The type and number of herbs and spices available differ depending on the geographical area. In Türkiye, a spice shop typically offers an average of 284 plant products.¹⁴ However, the dominant spice or herb in each shop may be different. Therefore, it was not feasible to do prick testing using a particular spice, as has been done in other studies.^{5,11,12,13} A study conducted on farmers in Denmark examined the relationship between sensitivity to common aeroallergens and their occupations. Farm environments are known for high levels of exposure to a wide range of antigenic and potentially allergenic organic dusts of plant origin. The risk of sensitization to common aeroallergens and some respiratory complaints, such as wheezing, was found

to be lower in farmers.¹⁵ Similar to our study, in addition to the healthy worker effect, respiratory symptoms in particular may contribute to a lower risk of atopic sensitization to common aeroallergens. However, we believe that a potential cross-reactivity may have affected work-related symptoms. In another study conducted on saffron workers, significant cross-reactivity was reported between saffron and 3 pollens commonly found in the area. Exploring biologic cross-reactions was not the primary objective of this study. However, both the modulation against common aeroallergens and the response against occupational agents occur in the respiratory mucosa. Our investigation revealed that the fact that workers with atopy were especially prone to eye, nose, and cough complaints suggested that there might be a mucosal interaction. In the research involving 3 spice mill workers, it was observed that participants who were exposed to high levels of spice dust developed IgE-mediated responses to multiple spices. Atopy is defined as a reaction to common allergens, which may pose a risk for work-related symptoms, supporting our hypothesis.¹⁶

Given that spices and dried herbs have bioactive contents that can cause irritant and immunological effects, the frequent exposure to these substances can constitute a significant occupational health issue for workers in spice shops. In our study, the prevalence of shortness of breath and coughing was 9.8% and 19.6%, respectively. A survey conducted on cinnamon growers in Sri Lanka revealed that 37.5% reported experiencing cough, 22.5% reported asthma, and 22.5% reported eye issues.¹⁷ Nasal and bronchial symptoms were reported in 16% and 6% of saffron workers, respectively.¹² In another study of female workers exposed to organic dust in food processing industries, the prevalence of all acute and chronic respiratory symptoms was found to be significantly higher among consistently exposed workers compared to control workers. The most common respiratory symptom was cough (58.7%), and the most common chronic respiratory complaint was chronic cough (40%).¹⁸ Occupational rhinitis prevalence is reported to be 2%-87% in workplaces exposed to high molecular weight agents such as spices.¹⁹ In a previous study, cases of occupational rhinoconjunctivitis had been reported in spice workers handling onion and garlic powders.²⁰

The study found that 22% of participants experienced work-related runny nose symptoms, while 19% experienced work-related eye problems. In another study conducted on spice factory workers, 43% of them experienced ocular symptoms as a result of inhaling spice powder. Additionally, 11% reported wheezing in the last year, while 10% reported waking up with shortness of breath (11). In the present study, work-related skin symptoms were reported by 5.4% of participants. The skin diseases that the participants had were not IgE-mediated. Interestingly, the prevalence of rosacea among workers was 3.5% (4 patients). Among cinnamon workers in Sri Lanka, 50% had skin irritation, 37.5% hair loss, and 12.5% rash.¹⁷ Among buckwheat workers, 18% had skin symptoms, and among saffron workers, 8% had cutaneous pruritus.^{21,12} The other 2 participants had alopecia areata. Protective equipment was hardly utilized by the spice shop staff due to their focus on sales and aesthetic considerations.

In addition, the levels of airborne dust in spice shops are consistently lower compared to those found in spice manufacturers. Therefore, we believe that the prevalence of work-related symptoms is lower in spice factories. Simultaneously, there is no legal requirement for dust quantification in these shops in our country, and the precise quantity of dust in the environment is not known.

The bias may be that employees with allergic symptoms are more willing to participate in the SPT. Another bias that occurs is the tendency to hire and retain relatively healthy individuals. Individuals with atopy generally avoid working in spice shops due to the presence of irritants and dust. In conclusion, spice shop workers are at risk for respiratory and eye symptoms, although comparatively lower than other spice industries. Having an atopic constitution is a risk factor for work-related symptoms. Ensuring occupational health and safety measures is important for all employees. In addition, employees with atopic constitution need more specific protection in allergen-dense work environments.

Ethics Committee Approval: This study was approved by the Ethics Committee of Hacettepe University (approval number: 1609\2021; date: September 7, 2021).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

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