

The prevalence and risk factors of asthma and allergic diseases among working adolescents

Erkan Cakir¹, Refika Ersu¹, Zeynep Seda Uyan¹, Sedat Oktem¹, Nezih Varol², Fazilet Karakoc¹, Bulent Karadag¹, Mesut Akyol³, and Elif Dagli¹

Summary

Certain occupational groups are known to be at particularly high risk of developing allergic diseases. The objective of the present study was to evaluate the prevalence of allergic diseases among working adolescents. The International Study of Asthma and Allergies in Childhood questionnaire was used. Four hundred and thirty six adolescents working in motor, lathe-finish, coiffure and textile and 366 high school students as control group were enrolled to the study. Mean age was 16.8 ± 1.2 years and 82.9% of them were male. There was no significant difference among groups for ever and current wheezing while doctor diagnosed asthma was higher in lathe-finish group ($p = 0.036$). Family history of allergy, history of allergic rhinitis, and active smoking were found to be risk factors for asthma and related symptoms. Working in coiffure ($p = 0.054$), and textile ($p = 0.003$) were significant risk factors for ever allergic rhinitis. Working in lathe finish ($p = 0.023$), coiffure ($p = .002$), and textile ($p < 0.001$) were associated with a higher risk for current allergic rhinitis. Working in coiffure was a risk factor for ever eczema ($p = 0.008$) and doctor diagnosed eczema ($p = 0.014$). It was concluded that working in lathe-finish was associated with doctor diagnosed asthma and active smoking was a risk factor

for asthma and related symptoms. Working in coiffure, textile and lathe-finish were risk factors for rhinitis, and working in coiffure was a risk factor for eczema. Preventive measures should be taken at the onset of employment in order to prevent or reduce the detrimental effects of exposures in these occupational groups. (*Asian Pac J Allergy Immunol 2010;28:122-9*)

Key words: Asthma, adolescent, rhinitis, eczema, occupation

Introduction

Asthma and other allergic diseases are common chronic illnesses of childhood and adolescence.^{1,2} The workplace and occupational exposures can trigger or induce allergic diseases.^{3,4} More than 250 occupational allergens have been identified as causative agents in the development of asthma.⁵⁻⁷ Certain occupational groups are known to be at particularly high risk of developing occupational asthma, including chemistry, construction, textile, furniture industry and hairdressing,⁷⁻⁹ Endotoxin, powder, perfume, acid anhydrides, acrylic compounds, and diisocyanates are associated with risk of allergic rhinitis and carpentry, bakery, health-care work, hairdressing and textile are high risk occupations for allergic rhinitis.⁸⁻¹⁰ Acid and alkali solutions, detergents, alcohol and other organic solvents are the most causative agents in development of eczema and hairdressing, catering, cleaning, health-care work are high-risk occupations for eczema.^{4,11,12} Young population based studies are important for preventive measures. Among working adolescents with allergic diseases, timely recognition, identification, and control of the occupational exposure causing allergic diseases improve the chance of prevention or complete recovery.

From the ¹Division of Pediatric Pulmonology,

²Faculty of Health Education, Marmara University, Istanbul, Turkey,

³Department of Biostatistics, Gulhane Military Medical Academy, Ankara, Turkey.

Corresponding author: Erkan Cakir

E-mail: erkancakir1@yahoo.com



The International Study of Asthma and Allergies in Childhood (ISAAC) is one of the most comprehensive efforts describing the prevalence, severity, and etiologic factors affecting asthma, allergic rhinitis, and eczema in children and adolescents.¹³ There have been epidemiological studies performed by ISAAC questionnaires over the past 10 years in Turkey.^{14,15} According to our knowledge up to date, no study was performed concerning the prevalence of asthma and other allergic diseases in working adolescents using ISAAC questionnaire in Turkey. There are limited data in the literature as well.¹⁶⁻²¹ Active smoking is associated with development of asthma during adolescence.^{22,23} There is also no ISAAC study investigating the relationship between active smoking and allergic diseases performed in Turkey. In this study, a survey, using ISAAC questionnaire, was performed to evaluate the prevalence and risk factors of asthma, allergic rhinitis and eczema among working adolescents.

Methods

The study was performed in Istanbul's Kartal County, an area populated with people from low to middle socioeconomic status. Working adolescents were enrolled from Kartal Vocational Training Centre, which offers apprenticeship training. The apprentices go to school once a week while they work during the rest of the week. The apprentices are trained on hairdressing, lathe-finish, motor and textile branches in the centre. Inclusion criteria for working groups were working at least for one year and starting to work before the age of 18. The control group was chosen from Kartal High School which is also located in the same district. Study was performed under the extend of ILO's (International Labour Organization) IPEC (International Program on the Elimination of Child Labour) project in cooperation with Turkish Confederation of Employer Associations and Marmara University Faculty of Health Sciences. Ethical approval was obtained from Marmara University School of Medicine Ethical Committee. Required permissions had been obtained from County National Education Directorate and the school managements to perform the study. The participants and the parents were informed about the study and its objectives and signed consent forms. The ISAAC protocol was used to identify the prevalence of allergic diseases. Questions

concerning sociodemographic and environmental characteristics of adolescents that may have potential risk factors for allergic disorders such as pet ownership, family history of allergic diseases, active and passive smoking, family income, and parental education were included. Family history of allergic disease was considered positive if at least one of the first-degree relatives was diagnosed as having one of the allergies. Participants who smoked at least one or more cigarettes per day regularly were considered as current smoker. All questionnaires were applied to participants in a face to face manner by the same pediatric pulmonologist.

Statistical analyses

Statistical analyses were performed using the SPSS for Windows Version 13.0 (SPSS Inc, Chicago, IL, USA) program. Numerical parameters were described with mean and standard deviation values, while distributions of the categorical measurements were investigated by frequency and percentages. Independent samples *t* test was used for evaluation of numerical parameters with normal distribution and Mann Whitney U test for evaluation of parameters without normal distribution. Frequencies of asthma and allergic diseases for risk factors were compared by using chi-squared tests (crude analysis). Risk factors having values of $p \leq 0.05$ were selected to be analyzed in multivariate analysis (adjusted analysis) using backward stepwise multiple logistic regression analyses for "adjusted odds ratio" (OR) and 95% confidence intervals (CI). Reference groups were determined for all variables. The results were evaluated in 95% confidence interval and at a significance level of $p \leq 0.05$.

Results

Four hundred and thirty-six working adolescents and 366 high school students as control group were enrolled to the study. The distribution of working adolescents was: 95 in motor, 94 in lathe-finish, 216 in hairdressing and 31 in textile group. The mean age of the participants was 16.8 ± 1.2 years and 665 (83%) of them were male. The demographic data is shown in Table 1.

The results of asthma and related symptoms

The prevalence and risk factors of asthma and related symptoms are shown in Table 2. The prevalence of ever wheezing, current wheezing



Table 1. Demographic characteristics of the participants

	Working adolescents n = 436	Control group n = 366	Total n = 802	Test value <i>p</i>
Gender; n (%)				
Female	67 (15.4)	70 (19.1)	137 (17)	$\chi^2 = 1.985$
Male	369 (84.6)	296 (80.9)	665(83)	<i>p</i> = 0.159
Age (Years); Mean \pm SD	16.86 \pm 1.24	16.66 \pm 1.08	16.8 \pm 1.2	t = 1.98 <i>p</i> = 0.06
Age; n(%)				
≤ 16	179 (42)	169 (46)	348 (43.3)	t = 2.123
> 17	257 (60)	197 (54)	454 (56.7)	<i>p</i> = 0.14
Pet ownership; n (%)	65 (14.9)	45 (12.3)	110 (13.7)	$\chi^2 = 1.148$ <i>p</i> = 0.28
Family atopy; n (%)	21 (4.8)	28 (7.7)	49 (6)	$\chi^2 = 2.785$ <i>p</i> = 0.09
Asthma history of family; n (%)	41 (9.4)	40 (10.9)	81 (10)	$\chi^2 = 0.51$ <i>p</i> = 0.47
Current smoker; n (%)	175 (40.1)	76 (20.8)	251(31.2)	$\chi^2 = 34.72$ <i>p</i> < 0.001
Parental smoking; n (%)	325(74.5)	225(61.5)	550 (68.5)	$\chi^2 = 15.76$ <i>p</i> < 0.001
Family income; n (%)				
≤ 999 TL	300 (68.8)	203 (55.5)	503 (62.7)	$\chi^2 = 15.150$
$> 1,000$ TL	136 (31.2)	163 (44.5)	299 (37.3)	<i>p</i> < 0.001

χ^2 , Chi-square test; t, independent samples t test, TL: Turkish Lira

and doctor diagnosed asthma were 11.2%, 9.8%, 2.7% in control group, 13.7%, 11.6%, 0.0% in motor, 13.8%, 8.5%, 6.4% in lathe-finish, 14.8%, 13%, 7.2% in hairdressing and 9.7%, 9.7%, 0.0% in textile groups, respectively. While there were no statistically significant differences among groups for ever and current wheezing, doctor diagnosed asthma was more common in lathe-finish group. Variables associated with ever wheezing were family history of allergy, history of allergic rhinitis and active smoking. Family history of allergy, history of allergic rhinitis and active smoking were also detected as risk factors for current wheezing. Family history of asthma, history of allergic rhinitis, active smoking, and working in lathe-finish were associated with a higher risk for doctor diagnosed asthma.

The results of allergic rhinitis

Prevalence and risk factors of allergic rhinitis are shown in Table 3. The prevalence of ever allergic rhinitis, current allergic rhinitis and doctor diagnosed allergic rhinitis were 9.8%, 8.5%, 2.7% in control group, 6.3%, 6.3%, 1.1% in motor, 14.9%, 14.9%, 3.2% in lathe-finish, 22.2%, 21.3%, 2.3% in hairdressing and 41.9%, 41.9%, 3.2% in textile groups, respectively. The multiple logistic regression analysis revealed female gender, age above 17 years old, family history of allergy, working in hairdressing, and working in textile as significant risk factors for ever allergic rhinitis. Female gender, being 17 years of age or older, family history of allergy, active smoking, working in lathe finish, working in coiffure, and working in textile were associated with a higher

risk for having current allergic rhinitis.

The results of eczema

Prevalence and risk factors of eczema are shown in Table 4. Prevalence of eczema, current eczema and doctor diagnosed eczema was 2.7%, 2.7%, 0.8% in control group, 2.1%, 0.0%, 2.1% in motor, 5.3%, 4.3%, 2.1% in lathe-finish, 7.9%, 6.0%, 4.6% in hairdressing and 3.2%, 3.2%, 0.0% in textile groups, respectively. While female gender was a risk factor for ever eczema, current eczema and doctor diagnosed eczema, family history of allergy was a risk factor for ever eczema and current eczema. Working in coiffure was a risk factor for ever eczema and doctor diagnosed eczema.

Discussion

In the present study, we have ascertained prevalence and risk factors for asthma, asthma related symptoms, allergic rhinitis and eczema among working adolescents and control group. Asthma is the most common occupational lung disease in industrialized countries, and the second most common occupational lung disease in developing countries.³⁻⁵ A positive relation was detected between occupation-related factors and respiratory symptoms in adult studies.^{3,6-9} There are a few published studies among working adolescents concerning prevalence and risk factors of asthma and related symptoms.¹⁶⁻²¹ The prevalence of asthma was between 4.2% and 6% in these studies.¹⁷⁻¹⁹ Two studies comparing working adolescents and control groups found no difference for prevalence of asthma.^{17,18} Another study showed no significant increase in the incidence of respiratory symptoms at the end of one year period in young workers.¹⁶



Table 2. Risk factors affecting prevalence of asthma and related symptoms

Factors	Ever wheezing				Current wheezing				Asthma diagnosed by a physician			
	n (%)	Crude OR (95% CI)	Adjusted OR (95% CI)	p	n (%)	Crude OR (95% CI)	Adjusted OR (95% CI)	p	n (%)	Crude OR (95% CI)	Adjusted OR (95% CI)	p
Gender	Male (n=665)	1.00			63 (9.5)	1.00			18 (2.7)	1.00		
	Female (n=137)	1.82 (1.11-2.96)			23 (16.8)	1.92 (1.15 - 3.26)			5 (3.6)	1.36 (0.50 - 3.73)		
Age	≤ 16 (n=348)	1.00			32 (9.2)	1.00			7 (2.0)	1.00		
	>17 (n=454)	1.63 (1.05-2.52)			54 (11.9)	1.33 (0.84 - 2.11)			16 (3.5)	1.78 (0.72 - 4.37)		
Pet ownership	No (n=692)	1.00			73 (10.5)	1.00			16 (2.3)	1.00		
	Yes (n=110)	1.31 (0.74-2.29)			13 (11.8)	1.14 (0.61 - 2.13)			7 (6.4)	2.86 (1.16 - 7.14)		
Family atopy	No (n=753)	1.00			74 (9.8)	1.00			19 (2.5)	1.00		
	Yes (n=49)	3.02 (1.57-5.84)	3.26 (1.48-7.20)	0.003	12 (24.5)	2.97 (1.49 - 5.96)	3.14 (1.39 - 7.12)	0.006	4 (8.2)	3.43 (1.12 - 10.52)		
Asthma history of family	No (n=721)	1.00			13 (10.1)	1.00			14 (1.9)	1.00		
	Yes (n=81)	1.99 (1.11-3.55)			13 (16.0)	1.69 (0.89 - 3.22)			9 (11.1)	6.31 (2.64 - 15.09)	7.19 (2.50 - 20.68)	<0.001
Current allergic rhinitis	No (n=692)	1.00			46 (6.6)	1.00			14 (2.0)	1.00		
	Yes (n=110)	8.16 (5.12-13.02)	8.46 (4.89-14.65)	<0.001	40 (36.4)	8.02 (4.92 - 13.10)	7.61 (4.33 - 13.37)	<0.001	9 (8.2)	4.31 (1.82 - 10.23)	3.92 (1.46 - 10.56)	0.007
Current smoking	No (n=551)	1.00			30 (5.4)	1.00			11 (2.0)	1.00		
	Yes (n=251)	5.1 (3.29-7.92)	4.86 (2.91-8.14)	<0.001	56 (22.3)	4.99 (3.11 - 8.00)	4.53 (2.62 - 7.80)	<0.001	12 (4.8)	2.47 (1.07 - 5.67)	3.15 (1.69 - 8.48)	0.023
Parental smoking	No (n=277)	1.00			26 (10.3)	1.00			6 (2.4)	1.00		
	Yes (n=525)	1.06 (0.67-1.66)			60 (10.9)	1.06 (0.65 - 1.73)			17 (3.1)	1.31 (0.51 - 3.35)		
Family income	≤ 999 TL (n=503)	0.72 (0.47-1.09)			49 (9.7)	0.76 (0.49 - 1.20)			11 (2.2)	0.53 (0.23 - 1.23)		
	> 1000 TL (n=299)	1.00			37 (12.4)	1.00			12 (4.0)	1.00		
Groups	Control group (n=366)	1.00			36 (9.8)	1.00			10 (2.7)	1.00		
	Motor (n=95)	1.26 (0.64-2.45)			11 (11.6)	1.2 (0.59 - 2.46)			0 (0.0)	0.00		
Groups	Lathe-finish (n=94)	1.27 (0.65-2.49)			8 (8.5)	0.85 (0.38 - 1.90)			6 (6.4)	2.43 (0.86 - 6.86)	4 (1.10 - 14.58)	0.036
	Hairdressing (n=216)	1.38 (0.84-2.67)			28 (13.0)	1.37 (0.81 - 2.31)			7 (3.2)	1.19 (0.45 - 3.18)		
Textile (n=31)	0.85 (0.25-2.92)			3 (9.7)	0.98 (0.28 - 3.39)			0 (0.0)	0.00			

OR: Odds Ratio, CI: Confidence interval, TL: Turkish Lira

Table 3. Risk factors affecting prevalence of allergic rhinitis

Factors	Ever allergic rhinitis				Current allergic rhinitis				Allergic rhinitis diagnosed by a physician			
	n (%)	Crude OR (95% CI)	Adjusted		n (%)	Crude OR (95% CI)	Adjusted		n (%)	Crude OR (95% CI)	Adjusted	
			OR (95% CI)	p			OR (95% CI)	p			OR (95% CI)	p
Gender	Male (n=665)	1.00			66 (9.9)	1.00			14 (2.1)	1.00		
	Female (n=137)	4.03 (2.61-6.21)	4.15 (2.46 – 7.01)	<0.001	44 (32.1)	4.29 (2.77 - 6.66)	4.87 (2.84 - 8.37)	<0.001	6 (4.4)	2.13 (0.80-5.64)		
Age	≤16 (n=348)	1.00			38 (10.9)	1.00			6 (1.7)	1.00		
	>17 (n=454)	1.51 (1.00-2.26)	1.74 (1.09 – 2.81)	0.022	72 (15.9)	1.54 (1.01 - 2.34)	1.78 (1.09 - 2.92)	0.021	14 (3.1)	1.81 (0.69-4.77)		
Pet ownership	No (n=692)	1.00			89 (12.9)	1.00			3 (2.7)	1.00		
	Yes (n=110)	1.57 (0.94-2.63)			21 (19.1)	1.59 (0.95 - 2.70)			17 (2.5)	0.9 (0.26-3.12)		
Family atopy	No (n=753)	1.00			97 (12.9)	1.00			17 (2.3)	1.00		
	Yes (n=49)	2.25 (1.16-4.39)	2.34 (1.10 – 5.00)	0.028	13 (26.5)	2.44 (1.25 - 4.77)	2.61 (1.21 - 5.62)	0.014	3 (6.1)	2.82 (0.80-9.98)		
Current smoking	No (n=551)	1.00			64 (11.6)	1.00			15 (2.7)	1.00		
	Yes (n=251)	1.65 (1.10-2.47)			46 (18.3)	1.71 (1.13 - 2.58)	1.74 (1.06 - 2.85)	0.029	5 (2.0)	0.73 (0.26-2.02)		
Parental smoking	No (n=277)	1.00			25 (9.9)	1.00			6 (2.4)	1.00		
	Yes (n=525)	1.72 (1.08-2.74)			85 (15.5)	1.66 (1.03 - 2.66)			14 (2.5)	1.01 (0.41-2.82)		
Family income	≤ 999 TL (n=503)	1.03 (0.68-1.54)			70 (13.9)	1.05 (0.69 - 1.59)			13 (2.6)	1.11 (0.44-2.81)		
	>1000 TL (n=299)	1.00			40 (13.4)	1.00			7 (2.3)	1.00		
Groups	Control group (n=366)	1.00			31 (8.5)	1.00			10 (2.7)	1.00		
	Motor (n=95)	0.62 (0.25-1.51)			6 (6.3)	0.73 (0.29 - 1.80)			1 (1.1)	0.38 (0.05-2.99)		
	Lathe-finish (n=94)	1.6 (0.83-3.12)			14 (14.9)	1.89 (0.96 - 3.72)	2.45 (1.13 - 5.33)	0.023	3 (3.2)	1.17 (0.32-4.35)		
	Hairdressing (n=216)	2.62 (1.64-4.19)	1.7 (0.99 – 2.90)	0.054	46 (21.3)	2.92 (1.79 - 4.78)	2.43 (1.40 - 4.23)	0.002	5 (2.3)	0.84 (0.29-2.50)		
	Textile (n=31)	6.62 (2.99-14.62)	3.87 (1.59 – 9.41)	0.003	13 (41.9)	7.8 (3.50 - 17.42)	6.61 (2.66 - 16.46)	<0.001	1 (3.2)	1.19 (0.15-9.59)		

OR: Odds Ratio, CI: Confidence interval, TL: Turkish Lira

No factor was found to be a risk factor for doctor diagnosed allergic rhinitis.

Table 4. Risk factors affecting prevalence of eczema

Factors	Ever eczema				Current eczema				Eczema diagnosed by a physician				
	n (%)	Crude		Adjusted	n (%)	Crude		Adjusted	n (%)	Crude		Adjusted	
		OR (95% CI)	p			OR (95% CI)	p			OR (95% CI)	p		OR (95% CI)
Gender													
Male (n=665)	20 (3.0)	1.00			16 (2.4)	1.00			9 (1.4)	1.00			
Female (n=137)	15 (10.9)	3.97 (1.98 – 7.86)	<0.001	4.89 (2.10 – 11.38)	12 (8.8)	3.89 (1.80 – 8.43)	4.03 (1.63 – 9.96)	0.002	8 (5.8)	4.52 (1.71 – 11.94)	7.76 (2.26 – 26.59)	0.001	
Age													
≤ 16 (n=348)	15 (4.3)	1.00			12 (3.4)	1.00			9 (2.6)	1.00			
>17 (n=454)	20 (4.4)	1.02 (0.51 – 2.02)		16 (3.5)	1.02 (0.48 – 2.19)				8 (1.8)	0.68 (0.26 – 1.77)			
Pet ownership													
No (n=692)	29 (4.2)	1.00		24 (3.5)	1.00				13 (1.9)	1.00			
Yes (n=110)	6 (5.5)	1.32 (0.53 – 3.23)		4 (3.6)	1.05 (0.36 – 3.13)				4 (3.6)	1.96 (0.63 – 6.15)			
Family atopy													
No (n=753)	28 (3.7)	1.00		22 (2.9)	1.00				15 (2.0)	1.00			
Yes (n=49)	7 (14.3)	4.32 (1.78 – 10.45)	0.004	4.39 (1.58 – 12.11)	6 (12.2)	4.64 (1.79 – 12.03)	3.96 (1.35 – 11.62)	0.012	2 (4.1)	2.09 (0.47 – 9.43)			
Current smoking													
No (n=551)	22 (4.0)	1.00		17 (3.1)	1.00				12 (2.2)	1.00			
Yes (n=251)	13 (5.2)	1.31 (0.65 – 2.65)		11 (4.4)	1.44 (0.66 – 3.12)				5 (2.0)	0.91 (0.32 – 2.62)			
Family income													
≤ 999 TL (n=503)	21 (4.2)	1.00		16 (3.2)	0.79 (0.37 – 1.69)				12 (2.4)	1.43 (0.50 – 4.17)			
>1000 TL (n=299)	14 (4.7)	1.13 (0.56 – 2.52)		12 (4.0)	1.00				5 (1.7)	1.00			
Groups													
Control group (n=366)	10 (2.7)	1.00		10 (2.7)	1.00				3 (0.8)	1.00			
Motor (n=95)	2 (2.1)	0.77 (0.17 – 3.55)		0 (0.0)	0.00				2 (2.1)	2.6 (0.43 – 15.80)			
Lathe-finish (n=94)	5 (5.3)	2 (0.67 – 5.60)		4 (4.3)	1.58 (0.49 – 5.16)				2 (2.1)	2.63 (0.43 – 15.98)			
Hairdressing (n=216)	17 (7.9)	3.04 (1.37 – 6.77)	0.008	3.3 (1.37 – 7.92)	13 (6.0)	2.28 (0.98 – 5.29)			10 (4.6)	5.87 (1.60 – 21.59)	5.33 (1.40 – 20.26)	0.014	
Textile (n=31)	1 (3.2)	1.19 (0.15 – 9.57)		1 (3.2)	1.19 (0.15 – 9.59)				0 (0.0)	0.00			

OR: Odds Ratio, CI: Confidence interval, TL: Turkish Lira

Similarly, while we found no difference between working adolescents and control group for prevalence of ever and current wheezing, the prevalence of doctor diagnosed asthma was higher only in lathe-finish group. These similar results may be explained by shorter duration of working, which was not sufficient to induce or trigger asthma and related symptoms. Several factors are associated with asthma and related symptoms. Allergic rhinitis, family history of allergy and asthma are known to be the most important factors in asthma and other allergic diseases.²⁴ It is established that allergic rhinitis and family history of asthma are related with asthma in young workers.^{19,20} This finding is consistent with our study as well. Active smoking is associated with development of asthma and respiratory symptoms during adolescence.^{22,23} We established smokers had a significantly higher prevalence of asthma and related symptoms. Our study is the first ISAAC study investigating the relationship between active smoking and allergic diseases performed among adolescents in Turkey. Since the onset of smoking decreased to 12-14 years of age both in our country and the world, smoking should be questioned as a risk factor in studies.

In adult studies, it is reported that textile workers and hairdressers have higher risk for rhinitis than controls.^{8,10,25,26} In an adolescent study, exposure to low molecular weight agents like industrial chemicals, drugs, fibrils and wood dusts was associated with a high risk for rhinitis compared to control.²⁷ Likewise in our study, working in textile, lathe-finish and coiffure was associated with a significant risk for rhinitis. Although smoking was found to be associated with an increased risk of rhinitis in an adult study,²⁸ another study failed to show this association.²⁹ In our study, active smoking was a risk factor for rhinitis.

Hairdressing is one of the most high-risk occupations for development of eczema and epidemiological studies show women are more affected from eczema than men.^{11,12,26,30} Likewise in our study, female gender and working in coiffure were found to be highly associated with eczema.

Although our study is the first ISAAC study investigating the prevalence and risk factors including smoking performed among working adolescents in Turkey, it has some limitations.

The data was collected only from a single center in Istanbul. This study may also include the other counties of Istanbul and the other cities to represent Turkey. Additionally, the toxins and the chemicals in the workplaces that the working adolescents are exposed may be measured and studies can be performed according to these measurements. In conclusion, preventive measures should be taken at the onset of employment in order to prevent or reduce the detrimental effects of exposures in these occupational groups.

References

- Burr ML, Butland BK, King S, Vaughan-Williams E. Changes in asthma prevalence: two surveys 15 years apart. *Arch Dis Child* 1989; 64: 1452-6.
- Robertson CF, Heycock E, Bishop J, Nolan T, Olinsky A, Phelan PD. Prevalence of asthma in Melbourne schoolchildren: changes over 26 years. *Br Med J* 1991; 302: 1116-8.
- Eagan TM, Gulsvik A, Eide GE, Bakke PS. Occupational airborne exposure and the incidence of respiratory symptoms and asthma. *Am J Respir Crit Care Med* 2002; 166: 933-8.
- Bernstein DI. Allergic reactions to workplace allergens. *JAMA* 1997; 278: 1907-13.
- Balmes JR. Occupational airways diseases from chronic low-level exposures to irritants. *Clin Chest Med* 2002; 23: 727-35.
- Toren K, Balder B, Brisman J, *et al.* The risk of asthma in relation to occupational exposures: a case-control study from a Swedish City. *Eur Respir J* 1999; 3: 496-501.
- Chan-Yeung M, Malo JL. Aetiological agents in occupational asthma. *Eur Respir J* 1994; 7: 346-71.
- Moscato G, Pignatti P, Yacoub MR, Romano C, Spezia S, Perfetti L. Occupational asthma and occupational rhinitis in hairdresser. *Chest* 2005; 128: 3590-8.
- Christiani DC, Wang XR, Pan LD, *et al.* Longitudinal changes in pulmonary function and respiratory symptoms in cotton textile workers: A 15-yr follow-up study. *Am J Respir Crit Care Med* 2001; 163: 847-53.
- Hellegren J, Karlson G, Toren K. The dilemma of occupational rhinitis: management options. *Am J Respir Med* 2003; 2: 333-41.
- Andersen KE. Occupational issues of allergic contact dermatitis. *Int Arch Occup Environ Health* 2003; 76: 347-50.
- Meding B. Differences between the sexes with regard to work-related skin disease. *Contact Dermatitis* 2000; 43: 65-71.
- Asher MI, Keil U, Anderson HR, *et al.* International study of asthma and allergies in childhood (ISAAC): rationale and methods. *Eur Respir J* 1995; 8: 483-91.
- Turktaş I, Selçuk ZT, Kalyoncu AF. Prevalence of asthma-associated symptoms in Turkish children. *Turk J Pediatr* 2001; 43: 1-11.
- Kuyucu S, Saraclar Y, Tuncer A, *et al.* Epidemiologic characteristics of rhinitis in Turkish children: The International Study of Asthma and Allergies in Childhood (ISAAC) phase 2. *Pediatr Allergy Immunol* 2006; 17: 269-77.
- Talini D, Monteverdi A, Lastrucci L, *et al.* One-year longitudinal study of young apprentices exposed to airway occupational sensitizers. *Int Arch Occup Environ Health* 2006; 79: 237-43.
- Radon K, Huemmer S, Dressel H, *et al.* Do respiratory symptoms predict job choices in teenagers? *Eur Respir J* 2006; 27: 774-8.



18. Kennedy SM, Chan-Yeung M, Teschke K, Karlen B. Change in Airway Responsiveness among Apprentices Exposed to Metalworking Fluids. *Am J Respir Crit Care Med* 1999; 159: 87–93.
19. Caldeira RD, Bettiol H, Barbieri MA, Terra-Filho J, Garcia CA, Vianna EO. Prevalence and risk factors for work related asthma in young adults. *Occup Environ Med* 2006; 63: 694-9.
20. Gautrin D, Ghezzi H, Malo JL. Rhinoconjunctivitis, bronchial responsiveness, and atopy as determinants for incident non-work-related asthma symptoms in apprentices exposed to high-molecular-weight allergens. *Allergy* 2003; 58: 608-15.
21. Cakir E, Uyan ZS, Varol N, *et al.* Effect of occupation and smoking on respiratory symptoms in working children. *Am J Ind Med* 2009; 52: 471-8.
22. Gilliland FD, Islam T, Berhane K, *et al.* Regular Smoking and Asthma Incidence in Adolescents. *Am J Respir Crit Care Med* 2006; 174: 1094–100.
23. Austin JB, Selvaraj S, Godden D, Russell G. Deprivation, smoking, and quality of life in asthma. *Arch Dis Child* 2005; 90: 253-7.
24. Vázquez Nava F, Saldívar González AH, Martínez Perales G, *et al.* Associations between family history of allergy, exposure to tobacco smoke, active smoking, obesity, and asthma in adolescents. *Arch Bronconeumol* 2006; 42: 621-6.
25. Leino T, Tammilehto L, Luukonen R, Normdan H. Self reported respiratory symptoms and diseases among hairdressers. *Occup Environ Med* 1997; 54: 452-5.
26. Leino T, Tammilehto L, Hytonen M, Sala E, Paakulainen H, Kanerva L. Occupational skin and respiratory diseases among hairdressers. *Scand J Work Environ Health* 1998; 24: 398-406.
27. Riu E, Dressel H, Windstetter D, *et al.* First months of employment and new onset of rhinitis in adolescents. *Eur Respir J* 2007; 30: 549-55.
28. Hellgren J, Lillienberg L, Jarlstedt J, Karlsson G, Toren K. Population-based study of non-infectious rhinitis in relation to occupational exposure, age, sex, and smoking. *Am J Ind Med* 2002; 42: 23-8.
29. Frank P, Morris J, Hazell M, Linehan M, Frank T. Smoking, respiratory symptoms and likely asthma in young people: evidence from postal questionnaire surveys in the Wythenshawe Community Asthma Project (WYCAP). *BMC Pulmonary Medicine* 2006; 6: 10.
30. Khumalo NP, Jessop S. Prevalence of cutaneous adverse effects of hairdressing: a systematic review. *Arch Dermatol* 2006; 142: 377-83.

