The Prevalence of Atopic Dermatitis in Adolescents Living in Denizli, Turkey (ISAAC Phase III): Is a Parent Working in Textile Industry a Risk Factor?

Denizli, Türkiye'de Yaşayan Adolesanlarda Atopik Dermatit Prevalansı (ISAAC Faz 3): Ebeveynin Tekstil Endüstrisinde Çalışması Bir Risk Faktörü müdür?

Ahmet AKÇAY,[a]
Fatma DUKSAL,[b]
Tülay BECERİR,[c]
Ahmet ERGİN,[c]
Nermin GÜLER[d]

[a]Clinic of Pediatric Immunology and Allergy, Liv Hospital, İstanbul
[b]Clinic of Pediatric Immunology and Allergy, Sivas Numune Hospital, Sivas
[c]Department of Pediatrics, Pamukkale University Faculty of Medicine, Denizli
[d]Division of Pediatric Immunology and Allergy, İstanbul University İstanbul Faculty of Medicine, Istanbul

Geliş Tarihi/*Received:* 19.12.2014
Kabul Tarihi/*Accepted:* 03.12.2015

Yazışma Adresi/*Correspondence:*
Fatma DUKSAL
Sivas Numune Hospital,
Clinic of Pediatric Immunology and Allergy, Sivas,
TÜRKİYE/TURKEY
fatmaduksal@gmail.com

ABSTRACT Objective: To evaluate trends in the prevalence of symptoms and risk factors of atopic eczema in 13-14 years old school children in Denizli. **Material and Methods:** This survey was first conducted in 2002 and repeated in 2008 using the same ISAAC questionnaire in the same age group. Possible risk factors were also asked. **Results:** A total of 3004 children (response rate, 93.8%) in 2002 and 4078 children (response rate, 75%) in 2008 were included into the studies. Doctor diagnosed eczema ever increased from 2.1% to 3% (POR =0.7, 95% CI = 0.52-0.95, p= 0.015). The prevalence of itch rash ever and itch rash in last 12 month decreased respectively from 20.8% to 14.7% (POR =1.52, 95% CI =1.39-1.72, p<0.001) and from 15.4% to 9.5% (POR=1.72, 95% CI=1.49-1.99, p<0.001). The prevalence of itch rash with typical distribution, itch rash cleared completely in last 12 month and kept awake at night by this itchy rash in last 12 month were significantly decreased in 2008. Atopic family history, tumble drying at home, working father or mother in textile industry were found as significant risk factors for atopic eczema in 2008. **Conclusion:** Although the prevalence of doctor diagnosed atopic eczema in 13-14 years age group was found to be increasing in Denizli, this study showed a decrease in the prevalence of typical clinical symptoms and signs of atopic eczema. Atopic family history, tumble drying at home, a working parent in textile industry were important risk factors for doctor diagnosed atopic eczema in 2008.

Key Words: Dermatitis, atopic; prevalence; risk factors; trends

ÖZET Amaç: Denizli'de 13-14 yaşındaki okul çocuklarında atopik egzemanın risk faktörlerinin ve semptomlarının prevalansındaki gidişatı değerlendirmektir. **Gereç ve Yöntemler:** Bu anket ilk olarak 2002'de yapılmış olup, 2008'de aynı ISAAC anketi kullanılarak, aynı yaş grubunda tekrarlanmıştır. Olası risk faktörleri de sorulmuştur. **Bulgular:** 2002 ve 2008'de sırasıyla toplam 3004 (cevap oranı, %93,8) ve 4078 (cevap oranı, %75) çocuk çalışmaya alınmıştır. Hayat boyu doktor tanılı egzema %2,1'den %3'e çıkmıştır (POR=0,7, %95 GA= 0,52-0,95 ve p=0,015). Hayat boyu kaşıntılı döküntü ve son 12 aydaki kaşıntılı döküntü sırasıyla %20,8'den %14,7'ye (POR=1,52, %95 GA=1,39-1,72 ve p<0,001) ve %15,4'ten %9,5'e (POR=1,52, %95 GA=1,39-1,72 ve p<0,001) düşmüştür. Tipik dağılımlı kaşıntılı döküntü, son 12 ayda tamamen düzelen kaşıntılı döküntü ve son 12 ayda bu kaşıntılı döküntü nedeniyle uykudan uyanma prevalansı, 2008'de anlamlı olarak azalmıştır. Atopik aile öyküsü, evin içinde çamaşır kurutulması, anne ya da babanın tekstil endüstrisinde çalışması 2008'de atopik egzema için anlamlı risk faktörleri olarak saptanmıştır. **Sonuç:** Bu çalışma; doktor tanılı atopik egzemanın, Denizli'deki 13-14 yaş grubunda artmış olduğunu göstermesine rağmen, atopik egzema bulgularının ve tipik klinik semptomlarının prevalansında azalma olduğunu göstermiştir. Atopik aile hikayesi, evde çamaşır kurutulması, ebeveynin tekstil endüstrisinde çalışması, 2008'de doktor tanılı atopik egzema için önemli risk faktörleri olarak bulunmuştur.

Anahtar Kelimeler: Dermatit, atopik; prevalans; risk faktörleri; eğilimler

doi: 10.5336/dermato.2014-43002

Turkiye Klinikleri J Dermatol 2016;26(1):1-9

Atopic eczema (AE) is a chronic inflammatory skin disorder and it is the most common form of eczema in childhood. AE is a major public health problem worldwide, affecting around 5% to 20% of children at ages 6 to 7 and 13 to 14 years.[1] Both genetic predisposition and environmental factors play a role in the pathogenesis of AE. The prevalence of asthma and allergic disease in children has been increasing in developed countries, but there is little information on these trends in Turkey.[2,3] The International Study of Asthma and Allergies in Childhood (ISAAC) attempted to study the global variations of atopic disorders in children by using standardized questionnaires.

The purposes of this study were to determine the time trend and possible risk factors of AE over a 6 years period, in 13-14 year-old school children in Denizli by using ISAAC methodology.

MATERIAL AND METHODS

PARTICIPANTS OF STUDY

A cross-sectional study using the standardized ISAAC written questionnaire was carried out in Denizli, in 2002, and repeated 6 year later in 2008. The studies were conducted on 13–14 years old schoolchildren in same schools and in the same season (April and May).[4] In final analysis 3004 and 4078 children included into the 2002 and 2008 studies respectively.

QUESTIONNAIRE

The standardized core symptom questionnaire for symptoms of AE composed of six questions.[2,3] The ISAAC questionnaire was translated into Turkish language.

Because the questionnaire has been used in some studies in Turkey previously, it is well known and validated in Turkish studies.[5-10] The questions are as follows:

Question 1: have you ever had an itchy rash which was coming and going for at least 6 months?

Question 2: have you had this itchy rash at any time in the last 12 months?

Question 3: has this itchy rash at any time affected any of the following places: the folds of the elbows, behind the knees, in front of the ankles, under the buttocks, or around the neck, ears or eyes?

Question 4: has this rash cleared completely at any time during the last 12 months?

Question 5: in the last 12 months, how often, on average, have you been kept awake at night by this itchy rash? Never in the last 12 months; Less than one night per week; One or more nights per week

Question 6: have you ever had eczema (atopic dermatitis) with doctor's confirmation?

Current eczema was defined as an itchy flexural rash in the past 12 months and was considered severe eczema if associated with 1 or more nights per week of sleep disturbance.[10]

The prevalence of itch rash ever, the prevalence of itch rash in in last 12 month, the prevalence of itch rash with typical distribution, the prevalence of itch rash cleared completely in last 12 months, the prevalence of kept awake at night by this itchy rash in last 12 months, the prevalence of doctor diagnosed AE ever were estimated respectively by questions 1, 2, 3, 4, 5 and 6.

An additional questionnaire was prepared and used in both studies to identify related risk factors (including sex; atopic family history; passive and active smoking at home; presence of domestic animals; stuffed toys; socioeconomic status, such as education level of mother and father, annual family income, number of people living at home, sharing bedroom, heating system and bathed in sunlight house). In addition to questions asked in 2002 study some other questions (member of the family with atopic disease, obesity, tumble drying at home, whether mother or father is working in textile and/or marble industry or not, accompaniment of children to their parents after school hours in textile and/or marble industry) were also asked in 2008 study.

The study approved by the ethics committee of School of Medicine, Pamukkale University.

STATISTICAL ANALYSIS

Statistical analysis included percentages, odds ratios (OR), 95% confidence interval (95% CI) and chi-squared test. Prevalence estimates were calculated by dividing positive responses to the given question by the total number of completed questionnaires. The 95% CI of these prevalence rates was also calculated. According to ISAAC policy, missing and inconsistent responses were included in the denominator for the prevalence calculations, but excluded from subsequent bivariate analysis.[11,12] To compare the differences in prevalence rates between the two studies, chi-squared test and prevalence odds ratios (POR) with 95% CI were performed. The relation between risk factors and asthma prevalence was performed by univariate analysis using chi squared tests and univariate odds ratio (uOR) and its 95% CI. P<0.05 was considered significant. The SPSS software package version 12 for Windows (SPSS, Chicago, IL, USA) was used for all statistical analyses.

RESULTS

The total number of children selected to participate to the study were 3200 and 5427 children in 2002 and 2008 studies respectively. The final number of children participated were 3004 and 4078 with an overall response rate of 93.8% in 2002 and 75% in 2008 studies. In the 2002 study, of 3200 children, 196 children did not complete the questionnaires due to; not in age group (156 children), refusal (21 children) and absenteeism (19 children). In 2008 study, because of refusal (39) and absenteeism (1310) an overall response rate was 75%. In 2002 study 50.1% and in 2008 53.5% of children were boys. There was no significant difference in age, sex and race distributions between the two study groups (Table 1).

PREVALENCE RESULTS

Doctor diagnosed eczema (DDE) ever increased from 2.1% to 3% (POR=0.7, 95% CI= 0.52-0.95, p= 0.015). The prevalence of itch rash ever and the prevalence of itch rash in last 12 month decreased respectively from 20.8% to 14.7% (POR=1.52, 95% CI=1.39-1.72, p<0.001) and from 15.4% to 9.5% (POR=1.72, 95% CI=1.49-1.99, p<0.001). The prevalence of itch rash with typical distribution, itch rash cleared completely in last 12 month and kept awake at night by this itchy rash in last 12 month were significantly decreased in 2008 (Table 2).

TABLE 1: Demographic data in the 2002 and 2008 surveys.

	2002 survey (phase I)	2008 survey (phase III)
Sex		
Male (n %)	1505(50.1)	2175(53.3)
Female (n%)	1499(49.9)	1903(46.7)
Age (year)	13-14	13-14
Race	Caucasian	Caucasian
Number of schools	16	16

RISK FACTORS RESULTS

There was no significant difference between boys and girls in the DDE in the 2002 study. In 2008 study, it was found more common in girls in univariate analysis, but in multivariate analysis this difference was not found significant (uOR=1.67, 95% CI=1.15-2.41; aOR=1.26, 95% CI=0.82-1.93) (Table 3).

A family history of atopy was significant factor for AE symptoms in univariate analysis in 2002 (uOR=1.72, 95% CI=1.02-2.90) but not in multivariate analysis (aOR=1.64, 95% CI=0.92-2.92). In 2008 study, both in univariate and in multivariate analysis family history of atopy was found significant risk factor for AE (uOR=3.52, 95% CI=2.40-5.18; aOR=3.38, 95% CI= 2.21-5.17).

Stuffed toys were significant risk factors for AE in univariate analysis in the 2008 study but not in multivariate analysis (uOR= 1.46, 95% CI= 1.00-2.14; aOR=1.13, 95% CI=0.74-1.75). They were not found as risk factors for AE in the 2002 study (uOR= 1.21, 95% CI=0.74-2.00; aOR=1.42, 95% CI= 0.78-2.58).

Active and passive smoking, having pets at home and risk factors related to socioeconomic status (education levels of mother and father, annual family income, number of people living in home, sharing bedroom, heating system, bathed in sunlight house) were not significant risk factors for AE symptoms in both studies.

TABLE 2: Time trends of atopic eczema symptoms.

	2002 survey 3004		2008 survey 4078			
Questions	**n (%)**	**95% CI**	**n (%)**	**95% CI**	**p-value**	**Prevalence odds ratio (95%)**
Itch rash ever	626 (20.8)	19.4-22.3	600 (14.7)	13.6-15.8	<0.001*	1.52 (1.39-1.72)
Itch rash in last 12 month	463 (15.4)	14.1-16.7	389 (9.5)	8.6-10.4	<0.001*	1.72 (1.49-1.99)
Itch rash with typical distribution	287 (9.5)	8.5-10.6	256 (6.2)	5.5-7.0	<0.001*	1.57 (1.32-1.88)
Itch rash cleared completely in last 12 month	332 (11.0)	9.9-12.0	261 (6.4)	5.6-7.1	<0.001*	1.81 (1.53-2.15)
Kept awake at night by this itchy rash in last 12 month	184 (6.1)	5.3-7.0	207 (5.0)	4.4-5.8	0.032*	1.22 (0.99-1.49)
Doctor-diagnosed eczema ever	64 (2.1)	1.6-2.7	122 (2.9)	2.5-3.5	0.015*	0.70 (0.52-0.95)

*p<0.05: significant; CI: Confidence interval.

TABLE 3: Time trends of factors affecting atopic eczema.

	2002 survey (phase I)			2008 survey (phase III)		
	Children with			**Children with**		
Factors	**Atopic Eczema n (%)**	**uOR**	**aOR**	**Atopic Eczema n (%)**	**uOR**	**aOR**
Sex						
Female	36 (2.4)	1.29 (0.78-2.13)	1.27 (0.70-2.31)	73 (4.0)	1.67 (1.15-2.41)*	1.26 (0.82-1.93)
Male	28 (1.9)	1.00		49 (2.4)	1.00	1.00
History of family atopy						
Yes	24 (3.0)	1.72 (1.02-2.90)*	1.64 (0.92-2.92)	81 (5.8)	3.52 (2.40-5.18)*	3.38 (2.21-5.17)
No	37 (1.8)	1.00	1.00	40 (1.7)	1.00	1.00
Passive smoking at home						
Yes	37 (2.3)	1.17 (0.71-1.95)	1.31 (0.74-2.31)	74 (3.5)	1.29 (0.88-1.89)	1.28 (0.85-1.92)
No	26 (1.9)	1.00	1.00	44 (2.8)	1.00	1.00
Active smoking						
Yes	3 (2.3)	1.07 (0.33-3.45)	1.0 (0.23-4.26)	3 (4.1)	1.30 (0.40-4.18	1.55 (0.46-5.20)
No	61 (2.1)	1.00	1.00	114 (3.1)	1.00	1.00
Domestic animals at home						
Yes	21 (2.3)	1.07 (0.63-1.81)	1.00 (0.55-1.82)	31 (2.9)	0.89 (0.58-1.34)	0.80 (0.51-1.26)
No	43 (2.1)	1.00	1.00	89 (3.3)	1.00	1.00
Stuffed toys						
Yes	33 (2.4)	1.21 (0.74-2.00)	1.42 (0.78-2.58)	73 (3.7)	1.46 (1.00-2.14)*	1.13 (0.74-1.75)
No	31 (2.0)	1.00	1.00	44 (2.6)	1.00	1.00
Education level of mother						
High school or university	6 (2.7)	1.30 (0.55-3.06)	1.79 (0.56-5.65)	11 (2.5)	0.72 (0.38-1.36)	0.60 (0.28-1.28)
Primary school	58 (2.1)	1.00	1.00	110 (3.4)	1.00	1.00
Education level of father						
High school or university	7 (1.5)	0.70 (0.31-1.55)	0.66 (0.27-1.81)	25 (3.6)	1.14 (0.73-1.79)	1.42 (0.81-2.48)
Primary school university	54 (2.2)	1.00	1.00	97 (3.2)	1.00	1.00
Number of people living in home						
4 or fewer	54 (2.1)	0.69 (0.35-1.37)	0.94 (0.39-2.26)	84 (3.4)	1.18 (0.80-1.74)	1.26 (0.79-2.02)
5 or more	10 (2.9)	1.00	1.00	38 (2.9)	1.00	1.00
Sharing bedroom						
2 or fewer	34 (2.2)	1.20 (0.72-2.02)	1.19 (0.67-2.09)	104 (3.3)	1.38 (0.74-2.60)	1.53 (0.67-3.49)
3 or more	26 (1.8)	1.00	1.00	11 (2.4)	1.00	1.00
Heating system						
Stove	49 (2.3)	1.24 (0.69-2.23)	1.50 (0.73-3.05)	67 (3.2)	1.01 (0.70-1.46)	1.03 (0.61-1.57)
Central heating	15 (1.8)	1.00	1.00	53 (3.2)	1.00	1.00
Bathed in sunlight house						
No	4 (2.6)	1.24 (0.44-3.46)	1.18 (0.36-3.87)	4 (2.1)	0.64 (0.23-1.75)	0.46 (0.11-1.91)
Yes	59 (2.1)	1.00	1.00	118 (3.3)	1.00	1.00

*p<0.05: Significant; uOR: Univariate odds ratio; aOR: Adjusted odds ratio; CI: Confidence interval.

In addition to above risk factors, in 2008 study, an allergic person in the family, tumble drying at home, working father or mother in textile industry were found as risk factors for DDE in univariate analysis. Multivariate analysis was performed for these significant risk factors and tumble drying at home, working father or mother in textile industry were found as risk factors for DDE. When only patients with allergic history were taken to the statistical analysis, the number was small for determination of other significant risk factors (who has an allergy in the family, etc). So, it could decrease the number of children inserted into the analysis. For this reason, it was not applied to multivariate analysis in order to prevent its possible effects on the evaluation of other risk factors. In addition, due to small number of responders and because the p value <0.05, other evaluated risk factors (Do you have accompaniment of children to their parents after school hours in textile industry, does child's father or mother work in marble industry, do you have accompaniment of children to their parents after school hours in marble industry) were not applied to multivariate analysis in order to prevent its possible effects on the evaluation of other risk factors (Table 4).

DISCUSSION

Our study was the first study which evaluated time trends of AE prevalence in 13-14 age groups using ISAAC protocol in Turkey. In the studies overall response rates of 73% of all centers for AE were between 90% and 100% for 13 to 14 years old schoolchildren.[1] In our studies the overall response rates were 93.8% and 75% in 2002 and in 2008 respectively. There have been many changes from 2002 to 2008 on education system in Turkey. There was a high school entrance exam in 2008 but not in 2002 during the study period. Due to this exam in 2008, there was a high rate of absenteeism. So it may be the reason for the lower response rate.

PREVALENCE OF AE

The incidence of AE is increasing in the last decades.[13] This study showed similar results, the prevalence of DDE has increased significantly in 2008 compared with those in 2002. But, the prevalence of AE symptoms decreased from 2002 to 2008. In 2006, the division of Pediatric Allergy was established in University Hospital in Denizli. The diagnosis of AE and other allergic disease has facilitated by increasing diagnostic methods. Additionally, pediatric allergists started to organize meetings to people and health personals face to face or by media. These efforts may have been effective in increasing prevalence of DDE. Prevalence of AE symptoms may be decreased because of the fact that diagnosed patients for AE have been cured more consciously and effectively. This decreasing trend for AE symptoms was similar to epidemiological studies especially in developing countries conducted in different parts of the world in the same age group.[10] In the study of ISAAC Phase One and Three Study Groups, there were variable results for the prevalence of AE symptoms in 13 to 14 years old children.[14] The most of the decreases were seen in developed countries such as the United Kingdom, Ireland, Sweden, Germany, and in New Zealand. In contrary, most of the increases in the prevalence were seen in developing countries, such as Mexico, Chile, Kenya, and Algeria, and some countries from Southeast Asia.

There was one study conducted in Ankara, capital of Turkey, which evaluated time trends of AE in children.[15] Lifetime and last 12 months prevalence of AE was found stabilized during a 5-year period from 1992 to 1997 in 6-13 year age group in Ankara.[15]

RISK FACTORS

Gender: We did not find any association between the gender and symptoms of AE similar to the study of Ece et al.[16] There was a female domination for symptoms of AE in 13-14 age groups at both 1999 and 2009 studies of ISAAC study groups.[1,10] There have been similar results from some countries that AE prevalence was lower among boys.[17-22] It could be due to different genetic and environmental interactions or may be due to hormonal factors.[1,10,17,19]

Family history of atopy: Atopy especially in mother, father, sister, brother, uncle or still was

TABLE 4: Other risk factors affecting prevalence of atopic dermatitis in 2008 study.

Factors	Children with atopic dermatitis n (%)	P Value	uOR	P Value	aOR
Who has an allergy in the family?		0.045*α	-	-	-
Mother or father	39 (6.5)				
Sister or brother	24 (6.6)				
Grandmother or grandfather	5 (2.9)				
Uncle or still	7 (6.7)				
Cousin	5 (2.9)				
Obesity		0.42		0.58	
Yes	3 (4.2)		1.29 (0.40-4.17)		1.38 (0.42-4.50)
No	117 (3.3)		1.00		1.00
Tumble drying		0.014*		0.025*	
Yes	21 (5.1)		1.82 (1.12-2.96)		1.76 (1.07-2.90)
No	94 (2.9)		1.00		1.00
Does child's father or mother work in textile industry ?		0.012*		0.022*	
Yes	40 (4.3)		1.61 (1.09-2.39)		1.59 (1.06-2.37)
No	74 (2.7)		1.00		1.00
Do you have accompaniment of children to their parents after school hours in textile industry ?		0.10β		-	-
Yes	14 (5.9)		1.57 (0.84-2.92)		
No	43 (3.8)		1.00		
Does child's father or mother work in marble industry ?		0.55 β		-	-
Yes	4 (3.0)		0.91 (0.32-2.52)		
No	87 (3.3)		1.00		
Do you have accompaniment of children to their parents after school hours in marble industry ?		0.39 β		-	-
Yes	2 (6.1)		1.53 (0.35-6.59)		
No	54 (4.0)		1.00		

* p<0.05: significant.

αBecause only patients with allergic history were taken to the statistical analysis, the number was small for the other significant risk factor (who has an allergy in the family). So, it could decrease the number of children inserted into the analysis. It was not applied to multivariate analysis in order to prevent its possible effects on the evaluation of other risk factors.

βDue to small number of responders and because the p value <0.05, they were not applied to multivariate analysis in order to prevent its possible effects on the evaluation of other risk factors.

important factor for increased risk for AE in both studies. Our results are consistent with the hypothesis that family history of atopy increases the risk of AE.[16,17,23-25] In a study from Seoul, in children the lifetime prevalence of itchy eczema, the 12-month prevalence of itchy flexural eczema and the lifetime prevalence of AE diagnosis were found significantly higher than those reported in similar studies conducted between 1995 and 2000.[26] They found that family history of atopy and moving into a newly built house before 1 year of age increased the risk of AE. So genetic and environment interaction was important for the development of AE.[26]

Smoking: Active and passive smoking were found as risk factors for AE in adult studies.[27,28] But we little know about association between smoking and AE in children and we did not find such an association. Morales Suárez-Varela et al. reported that passive smoking was a risk factor of AE, in 6-7 years old but not in 13-to-14 years old children.[29] They suggested that young children spend more time with their families, for this reason, they are exposed to smoking more than adolescent group. Kramer et al. reported that environmental tobacco smoke could have only an adjuvant effect on AE in children genetically prone to allergies.[27,30] In another study from Turkey no association was found between smoking and AE.[16]

House dust mites (HDM): HDM are located mostly in bedrooms and on stuffed toys.[17,31,32] Chil-

dren spend most of their time in their bedroom playing with and mostly sleep with their stuffed toys. So, this leads to allergenic sensitization.[31] Although in univariate analysis in 2008, stuffed toys was found as risk factor for AE symptoms, in multivariate analysis this significance was not important. In addition in the 2002 study stuffed toys were not found as a risk factor for AE.

Socioeconomic status: It was showed that socioeconomic status did not affect allergic disease development. So other factors should be considered for the increase in the prevalence of AE.[16,33,34] In our study we did not find any association between the symptoms of AE and the level of socioeconomic status related risk factors including education level of mother and father, annual family income, number of people living in home, sharing bedroom, heating system, bathed in sunlight house. In a study in Spanish schoolchildren, there was no significant association between the type of indoor energy sources (biomass, gas and electricity) used and the presence of AD.[35]

Domestic animal at home: Early-life exposure to cats was found as a risk factor for symptoms of AE in 6-7, but in 13-14 year old children. Exposure to dogs was found as a risk factor for symptoms of AE worldwide.[36] We did not found any association between domestic animal at home and the symptoms of AE in both studies similar to the study of Ece et al.[14]

Textile and marble industry: These industries play important roles for the development of Denizli. The vast majority of people work in textile and marble factories to make a living.[37] For this reason we investigated whether these factories increased the symptoms of AE. Contact to textile fibers or textile dyes causes irritant reactions on skin.[38-40] Synthetic dressing and wool, cause irritation and itching on the skin. Cotton is usually recommended for the patients with AE. But cotton also predispose to bacterial and fungal infections.[41] In our previous study on allergic rhinitis we found that accompaniment of children to their parents in textile industry was the risk factor for doctor diagnosed allergic rhinitis.[42] It may be due to inhalation of chemical agents resulting from cotton dust and textile dyeing.[43] In the current study, we did not found any association between accompaniments of children to their parents in textile industry. But working mother or father in the textile industry was associated with risk of AE. We thought that the signs of skin for AE may be increased as the children contact with their parents. While, we found no association between accompaniment of children to their parents in marble industry or working mother or father in the marble industry and risk of AE similar to previous study in AR.[42]

Obesity: Silverberg et al. found positive correlation between obesity occurring within the first 2 years of life and the symptoms of AE.[44] In addition, they reported that prolonged obesity in early childhood plays important role for the severe AE. They suggested that this association may be due to immaturity of the immune system in the first year of life. But we did not found any association between obesity and AE symptoms.

Tumble drying: We found significant association between tumble drying and risk of AE. Tumble drying in the home may lead to humidity and dampness. A positive correlation between AE symptoms and dampness was shown.[45] HDM tend to grow in damp at home and Tan et al. reported that avoidance of HDM from bedroom resulted in improvement in symptoms of AE.[46]

There were different results for asthma, allergic rhinitis and AE in the most of the same centers over time. So it was suggested that as well as genetic predisposition, different environmental conditions may affect allergic diseases in different ways.[47,48] In the current literatures there have been variable results for the risk factors of AE in children. It was reported that food hypersensitivity plays an important role in the pathogenesis of AE.[49,50] In addition, wide range of the prevalence of AE (33% and 75%) may be due to the differences in the definition of the food allergy in AE or the selection of severe AE patients.[51,52] In some other studies it was reported that, history of measles, respiratory infection, eating vegetables

every day, parasite infestation, alcohol intake during pregnancy, the children of mothers who worked during pregnancy and precipitation and humidity were associated with AE.[17,53-56] But AE was found negatively correlated with sunny weather.[56]

In conclusion, the prevalence of doctor diagnosed AE in 13-14 years old school children was found to be increasing in Denizli. But a decrease in the prevalence of symptoms and signs of AE was observed. Family history of atopy, tumble drying at home, a working parent in textile industry were important risk factors for doctor diagnosed atopic eczema in 2008. Environmental conditions and other possible risk factors for AE symptoms show great regional variation. Life-style changes play important role in changing risk factors. Further studies, to understand the prevalence and risk factors of AE in childhood are needed for the development of preventive strategies.

REFERENCES

1. Williams H, Robertson C, Stewart A, Aït-Khaled N, Anabwani G, Anderson R, et al. Worldwide variations in the prevalence of symptoms of atopic eczema in the International Study of Asthma and Allergies in Childhood. J Allergy Clin Immunol 1999;103(1 Pt 1):125-38.
2. Worldwide variations in the prevalance of asthma symptoms: the International Study of Asthma and Allergies in Childhood (ISSAC). Eur Respir J 1998;12(2):315-35.
3. Asher MI, Keil U, Anderson HR, Beasley R, Crane J, Martinez F, et al. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. Eur Respir J 1995; 8(3):483-91.
4. Akcay A, Tamay Z, Inan M, Gürses D, Zencir M, Ones U, et al. [The prevalence of symptoms related to allergic diseases in 13-14- yr-old school children in Denizli]. Turk Arch Ped 2006;41(2):81-6.
5. Talay F, Kurt B, Tug T, Yilmaz F, Goksugur N. Prevalence and risk factors of asthma and allergic diseases among schoolchildren in Bolu, Turkey. Acta Paediatr 2008;97(4):459-62.
6. Saraclar Y, Yiğit S, Adalioğlu G, Tuncer A, Tunçbilek E. Prevalence of allergic diseases and influencing factors in primary-school children in the Ankara Region of Turkey. J Asthma 1997;34(1):23-30.
7. Selcuk ZT, Caglar T, Enünlü T, Topal T. The prevalence of allergic diseases in primary school children in Edirne, Turkey. Clin Exp Allergy 1997;27(3):262-9.
8. Küçüködük S, Aydin M, Cetinkaya F, Dinc H, Gürses N, Saraçlar Y. The prevalence of asthma and other allergic diseases in a province of Turkey. Turk J Pediatr 1996;38(2): 149-53.
9. Karaman O, Turgut CS, Uzuner N, Olmez D, Babayigit A, Kose S, et al. The determination of asthma, rhinitis, eczema, and atopy prevalence in 9- to 11-year-old children in the city of Izmir. Allergy Asthma Proc 2006;27(4):319-24.
10. Odhiambo JA, Williams HC, Clayton TO, Robertson CF, Asher MI; ISAAC Phase Three Study Group. Global variations in prevalence of eczema symptoms in children from ISAAC Phase Three. J Allergy Clin Immunol 2009; 124(6):1251-8.e23.
11. Lee DA, Winslow NR, Speight AN, Hey EN. Prevalence and spectrum of asthma in childhood. Br Med J (Clin Res Ed) 1983; 286(6373):1256-8.
12. Annus T, Riikjärv MA, Rahu K, Björkstén B. Modest increase in seasonal allergic rhinitis and eczema over 8 years among Estonian schoolchildren. Pediatr Allergy Immunol 2005;16(4):315-20.
13. Sturgill S, Bernard LA. Atopic dermatitis update. Curr Opin Pediatr 2004;16(4):396-401.
14. Williams H, Stewart A, von Mutius E, Cookson W, Anderson HR; International Study of Asthma and Allergies in Childhood (ISAAC) Phase One and Three Study Groups. Is eczema really on the increase worldwide? J Allergy Clin Immunol 2008;121(4):947-54.e15.
15. Kalyoncu AF, Selçuk ZT, Enünlü T, Demir AU, Cöplü L, Sahin AA, et al. Prevalence of asthma and allergic diseases in primary school children in Ankara, Turkey: two cross-sectional studies, five years apart. Pediatr Allergy Immunol 1999;10(4):261-5.
16. Ece A, Ceylan A, Saraçlar Y, Saka G, Gürkan F, Haspolat K. Prevalence of asthma and other allergic disorders among schoolchildren in Diyarbakir, Turkey. Turk J Pediatr 2001; 43(4):286-92.
17. Munivrana Skvorc H, Plavec D, Munivrana S, Skvorc M, Nogalo B, Turkalj M. Prevalence of and risk factors for the development of atopic dermatitis in schoolchildren aged 12-14 in northwest Croatia. Allergol Immunopathol (Madr) 2014;42(2):142-8.
18. Tay YK, Kong KH, Khoo L, Goh CL, Giam YC. The prevalence and descriptive epidemiology of atopic dermatitis in Singapore school children. Br J Dermatol 2002;146(1):101-6.
19. Martín Fernández-Mayoralas D, Martín Caballero JM, García-Marcos Alvarez L. [Prevalence of atopic dermatitis in schoolchildren from Cartagena (Spain) and relationship with sex and pollution]. An Pediatr (Barc) 2004; 60(6):555-60.
20. Miyake Y, Yura A, Iki M. Cross-sectional study of allergic disorders in relation to familial factors in Japanese adolescents. Acta Paediatr 2004;93(3):380-5.
21. Al-Sahab B, Atoui M, Musharrafieh U, Zaitoun F, Ramadan F, Tamim H. Epidemiology of eczema among Lebanese adolescents. Int J Public Health 2008;53(5):260-7.
22. Hugg T, Ruotsalainen R, Jaakkola MS, Pushkarev V, Jaakkola JJ. Comparison of allergic diseases, symptoms and respiratory infections between Finnish and Russian school children. Eur J Epidemiol 2008;23(2):123-33.
23. Civelek E, Sahiner UM, Yüksel H, Boz AB, Orhan F, Uner A, et al. Prevalence, burden, and risk factors of atopic eczema in schoolchildren aged 10-11 years: a national multicenter study. J Investig Allergol Clin Immunol 2011;21(4):270-7.
24. Batlles Garrido J, Torres-Borrego J, Bonillo Perales A, Rubí Ruiz T, González Jiménez Y, Momblán De Cabo J, et al. Prevalence and factors linked to atopic eczema in 10- and 11-year-old schoolchildren. Isaac 2 in Almeria, Spain. Allergol Immunopathol (Madr) 2010; 38(3):174-80.
25. Schmitz R, Atzpodien K, Schlaud M. Prevalence and risk factors of atopic diseases in German children and adolescents. Pediatr Allergy Immunol 2012;23(8):716-23.
26. Lee JY, Seo JH, Kwon JW, Yu J, Kim BJ, Lee SY, et al. Exposure to gene-environment interactions before 1 year of age may favor the development of atopic dermatitis. Int Arch Allergy Immunol 2012;157(4):363-71.

27. Rönmark EP, Ekerljung L, Lötvall J, Wennergren G, Rönmark E, Torén K, et al. Eczema among adults: prevalence, risk factors and relation to airway diseases. Results from a large-scale population survey in Sweden. Br J Dermatol 2012;166(6):1301-8.
28. Lee CH, Chuang HY, Hong CH, Huang SK, Chang YC, Ko YC, et al. Lifetime exposure to cigarette smoking and the development of adult-onset atopic dermatitis. Br J Dermatol 2011;164(3):483-9.
29. Morales Suárez-Varela M, García-Marcos L, Kogan MD, Llopis González A, Martínez Gimeno A, Aguinaga Ontoso I, et al. Parents' smoking habit and prevalence of atopic eczema in 6-7 and 13-14 year-old schoolchildren in Spain. ISAAC phase III. Allergol Immunopathol (Madr) 2008;36(6):336-42.
30. Krämer U, Lemmen CH, Behrendt H, Link E, Schäfer T, Gostomzyk J, et al. The effect of environmental tobacco smoke on eczema and allergic sensitization in children. Brit J Dermatol 2004;150(1):111-8.
31. Fernández-Caldas E. Dust mite allergens: mitigation and control. Curr Allergy Asthma Rep 2002;2(5):424-31.
32. Sidenius KE, Hallas TE, Brygge T, Poulsen LK, Mosbech H. House dust mites and their allergens at selected locations in the homes of house dust mite-allergic patients. Clin Exp Allergy 2002;32(9):1299-304.
33. Mercer MJ, Joubert G, Ehrlich RI, Nelson H, Poyser MA, Puterman A, et al. Socioeconomic status and prevalence of allergic rhinitis and atopic eczema symptoms in young adolescents. Pediatr Allergy Immunol 2004;15(3): 234-41.
34. Bergmann RL, Edenharter G, Bergmann KE, Lau S, Wahn U. Socioeconomic status is a risk factor for allergy in parents but not in their children. Clin Exp Allergy 2000;30(12):1740-5.
35. Vicedo-Cabrera AM, García-Marcos L, Llopis-González A, López-Silvarrey-Varela Á, Miner-Canflanca I, Batlles-Garrido J, et al. Atopic dermatitis and indoor use of energy sources in cooking and heating appliances. BMC Public Health 2012;12:890.
36. Brunekreef B, Von Mutius E, Wong G, Odhiambo J, García-Marcos L, Foliaki S; ISAAC Phase Three Study Group: Exposure to cats and dogs, and symptoms of asthma, rhinoconjunctivitis, and eczema. Epidemiology 2012; 23(5):742-50.
37. Republic of Turkey, Prime Ministry Turkish Statistical Institute (TURKSTAT). http://www.die.gov.tr/ (Accessed 23 March 2012).
38. Hatch KL, Maibach HI. Textile dye allergic contact dermatitis prevalence. Contact Dermatitis 2000;42(4):187-95.
39. Lazarov A. Textile dermatitis in patients with contact sensitization in Israel: a 4-year prospective study. J Eur Acad Dermatol Venereol 2004;18(5):531-7.
40. Gasperini M, Farli M, Lombardi P, Sertoli A. Contact dermatitis in the textile and garment industry. In: Frosch PJ, ed. Current Topics in Contact Dermatitis. 1sted. Berlin: Springer-Verlag; 1989. p.326-9.
41. Mason R. Fabrics for atopic dermatitis. J Fam Health Care 2008;18(2):63-5.
42. Duksal F, Akcay A, Becerir T, Ergin A, Becerir C, Guler N. Rising trend of allergic rhinitis prevalence among Turkish schoolchildren. Int J Pediatr Otorhinolaryngol 2013;77(9):1434-9.
43. Christiani DC, Eisen EA, Wegman DH, Ye TT, Lu PL, Gong ZC, et al. Respiratory disease in cotton textile workers in the People's Republic of China. I. Respiratory symptoms. Scand J Work Environ Health 1986;12(1):40-5.
44. Silverberg JI, Kleiman E, Lev-Tov H, Silverberg NB, Durkin HG, Joks R, et al. Association between obesity and atopic dermatitis in childhood: a case-control study. J Allergy Clin Immunol 2011;127(5):1180-6.e1.
45. McNally NJ, Williams HC, Phillips DR. Atopic eczema and the home environment. Br J Dermatol 2001;145(5):730-6.
46. Friedmann PS, Tan BB. Mite elimination--clinical effect on eczema. Allergy 1998;53(48 Suppl):97-100.
47. Williams HC. Atopic eczema. BMJ 1995; 311:1241-2.
48. Asher MI, Montefort S, Björkstén B, Lai CK, Strachan DP, Weiland SK, et al; ISAAC Phase Three Study Group. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phase Three multicountry cross-sectional survey. Lancet 2006; 368(9537):733-43.
49. Rancé F. Food allergy in children suffering from atopic eczema. Pediatr Allergy Immunol 2008;19(3):279-84.
50. Uenishi T, Sugiura H, Tanaka T, Uehara M. Role of foods in irregular aggravation of skin lesions in children with atopic dermatitis. J Dermatol 2008;35(7):407-12.
51. Suh KY. Food allergy and atopic dermatitis: separating fact from fiction. Semin Cutan Med Surg 2010;29(2):72-8.
52. Rowlands D, Tofte SJ, Hanifin JM. Does food allergy cause atopic dermatitis? Food challenge testing to dissociate eczematous from immediate reactions. Dermatol Ther 2006; 19(2):97-103.
53. Phathammavong O, Ali M, Phengsavanh A, Xaysomphou D, Odajima H, Nishima S, et al. Prevalence and potential risk factors of rhinitis and atopic eczema among schoolchildren in Vientiane capital, Lao PDR: ISAAC questionnaire. Biosci Trends 2008;2(5):193-9.
54. Carson CG. Risk factors for developing atopic dermatitis. Dan Med J 2013;60(7):B4687.
55. Wang IJ, Wen HJ, Chiang TL, Lin SJ, Chen PC, Guo YL. Maternal employment and atopic dermatitis in children: a prospective cohort study. Br J Dermatol 2013;168(4):794-801.
56. Suárez-Varela MM, García-Marcos Alvarez L, Kogan MD, González AL, Gimeno AM, Aguinaga Ontoso I, et al. Climate and prevalence of atopic eczema in 6- to 7-year-old school children in Spain. ISAAC phase III. Int J Biometeorol 2008;52(8):833-40.