

Prevalence and Risk Factors of Atopic Eczema in Turkish Adolescents

Ahmet Akcay, M.D.,* Zeynep Tamay, M.D.,† Ahmet Ergin, M.D.,‡
and Nermin Guler, M.D.†

*Division of Pediatric Allergy, Department of Pediatrics, Liv Hospital, Istanbul, Turkey, †Division of Pediatric Allergy, Department of Pediatrics, School of Medicine, Istanbul University, Istanbul, Turkey, ‡Department of Pediatrics, School of Medicine, Pamukkale University, Denizli, Turkey

Abstract: Atopic eczema (AE) is the most common childhood inflammatory skin condition. The aim of this study was to evaluate the prevalence of AE and its relation to various risk factors. In a cross-sectional study, 9,991 children ages 13 to 14 years in 61 primary schools in 32 districts of Istanbul were evaluated. The prevalence of AE and associated symptoms was assessed using the International Study of Asthma and Allergies in Childhood protocol. The relationship between risk factors and AE was evaluated using multivariate logistic regression analysis. Ten thousand nine hundred eighty-four questionnaires were distributed to 13- and 14-year-old children in 61 schools in 32 districts of Istanbul, 9,991 of which were suitable for analysis, for an overall response rate of 91.7%. There were 4,746 boys (47.9%) and 5,166 girls (52.1%) (M/F ratio 0.920). The rates of itchy rash ever, 12-month itchy rash, and doctor-diagnosed AE ever were 18.2%, 12.0%, and 2.8%, respectively. The difference between rates for itchy rash ever, 12-month itchy rash and doctor-diagnosed AE was high (12.8–31.3, 5.8–24.8, and 0–17.2, respectively) between the districts of Istanbul. Female sex, AE family history, watching television more than 5 hours a day, region of the district, and tonsillectomy history were found to be significantly associated with doctor-diagnosed AE at $p < 0.05$ in multivariate analysis. This study found a low prevalence of doctor-diagnosed AE and related symptoms in Istanbul. Several risk factors were found to be associated with doctor-diagnosed AE.

Epidemiology has the potential to add greatly to our understanding by elucidating the risk factors for allergic diseases. The International Study of Asthma and Allergies in Childhood (ISAAC) was founded to maximize the value of epidemiologic research on asthma and allergic disease by establishing a stan-

dardized methodology and facilitating international collaboration (1,2).

Atopic eczema (AE) is the most common childhood inflammatory skin condition (3), with a prevalence ranging from 0.6% to 20.5% throughout the world (4). The prevalence of childhood AE in 13- and

Address correspondence to Ahmet Akcay, M.D., Liv Hospital, Ahmet Adnan Saygun Cad. Canan Sok. No:5 PK: 34340 Ulus, Besiktas Istanbul, Turkey, or e-mail: drahmetakcay@gmail.com.

14-year-olds in different regions of Turkey ranged from 2.1% to 2.7% (5–7) in studies performed using the ISAAC protocol, but to our knowledge, based on a PubMed search and investigation of local publications, no study has determined the prevalence of eczema and related symptoms in Istanbul, which is the largest city in Turkey, constituting the country's greatest economic and cultural center.

The prevalence of AD has increased worldwide (8–11). This increase may be due to changes in lifestyle, nutrition, and environmental factors such as outdoor pollution and allergen exposure, increasing diversity of foods consumed, modernized housing, increased industrialization, and urbanization (12). Being sedentary, such as viewing a lot of television, is associated with obesity (13), and obesity has been associated with AD (14). The association between obesity and television viewing and the risk of eczema have rarely been examined.

The aim of this study was to evaluate the prevalence of AE symptoms using the ISAAC questionnaire and some relevant potential risk factors in 13- and 14-year-old schoolchildren in all districts in Istanbul and to make comparisons between other cities in Turkey and other countries.

METHODS

Study Area

Istanbul is one of the largest urban agglomerations in Europe. Istanbul experienced rapid growth and its population increased 10 times from the mid-1950s to early the 2000s. This increase was largely fueled by migrants from eastern Turkey seeking employment and better living conditions. The number of residents of Istanbul originating from seven northern and eastern provinces is greater than the populations of their entire respective provinces. The European side is the old and crowded part of the city. The Asian side has one-third of the city's population, but only one-quarter of its employment, yet has better infrastructure and urban planning than the European side.

Istanbul is inhabited by 13.5 million citizens living in 11,868 km² and has 32 districts. Every district has its own social, economic, and geographical features, so every district can be evaluated as a single region with its own dynamics (15).

Study Population and Design

The study was conducted in Istanbul between March 2004 and July 2005. A total of 181,271 primary

school children were attending grade 8 in Istanbul; it was planned to include 5% from each district ($n = 9,063$) in the survey. First, we obtained the number of 8th-grade children and the number of schools for each district from official data. We included more than 5% of the children and schools to obtain an adequate number of children (5%) for the survey since we would expect that some children would be excluded because of the age range of the study, reluctance to participate the study, absenteeism, and informal responses to the survey. Additionally, because we did not have the exact number of students in each school, we roughly calculated the number of children. According to this calculation, 10,894 children ages 13 to 14 in 61 randomly selected primary schools from 32 districts, without selection according to urban or suburban residence or variations in socioeconomic status, were surveyed using the ISAAC questionnaire. The 13- to 14-year-old age group was chosen to enable the use of a self-completed questionnaire. Teachers distributed the questionnaires for self-completion.

The standardized core symptom questionnaire for 13- to 14-year-old children consisted of six questions about symptoms related to AE (2):

- Have you ever had an itchy rash that came and went for at least 6 months?
- Have you had this itchy rash at any time in the last 12 months?
- 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?
- Has this rash cleared completely at any time during the last 12 months?
- In the last 12 months, how often, on average, has this itchy rash kept you awake at night (never in the last 12 months, less than 1 night per week, 1 or more nights per week)?
- Have you ever had eczema (atopic dermatitis) with doctor's confirmation?

The last question, "Have you ever had eczema (atopic dermatitis) with doctor's confirmation?", was used to determine an exact diagnosis without any suspicion. Although it is not part of the ISAAC protocol, this question has been used in other studies performed in Turkey (5–7).

The standardized ISAAC phase I written core questionnaire was translated into Turkish and used. Studies have been conducted in Turkey using the modified version of the ISAAC questionnaire (5–7), so it is well known.

An additional questionnaire was prepared to identify demographic features and potential risk factors, including sex, atopic family history, hours of television watched during a day, number of siblings living at home, location of the school, being born in Istanbul, time lived in Istanbul, presence of domestic animals (fish, cats, dogs, birds) during the last 12 months, and tonsillectomy or adenotonsillectomy history.

Statistical Analysis

The statistical significance of differences was assessed using the chi-square test, and $p < 0.05$ was considered significant. Prevalence estimates were calculated by dividing positive responses to the given question by the total number of completed questionnaires, excluding missing or inconsistent responses from subsequent bivariate analyses according to ISAAC recommendations (1,2). Children with no response to a question were excluded from the analysis of the relevant variable. Risk factors were evaluated only for doctor-diagnosed AE prevalence since they are the most reliable data. The relationship between risk factors and doctor-diagnosed AE prevalence was determined using univariate analysis with chi-square tests and univariate odds ratios (uORs) and their 95% confidence intervals (CIs). Significant factors from the univariate analysis were used in multivariate logistic regression analysis to assess the independent effects of risk factors on doctor-diagnosed AE with adjusted odds ratios (aORs) and their 95% CIs. A backward logistic regression model was used with all variables in the model. Eventually the model was as described in Table 3, although a multivariate regression result obtained from a model with only significant variables in bivariate analyses was displayed. This was done to keep Table 3 simple and not to inflate p-values. SPSS version 12.0 was used for all statistical analyses (SPSS, Chicago, IL).

Ethical Consideration

The Ethics Committee of Istanbul University, Istanbul School of Medicine approved the study.

RESULTS

A total of 10,984 questionnaires were distributed to 13- to 14-year-old children from 61 schools in 32 districts of Istanbul; 10,298 were completed (response rate 94.5%) and 9,991 were suitable for analysis (response rate 91.7%). Of the 10,984 children, 993

were not included in the study; 870 were not in the age group, 34 did not participate, and 89 were absent.

There were 4,746 boys (47.9%) and 5,166 girls (52.1%) (M/F ratio 0.92). The prevalences of itchy rash ever, itchy rash in the last 12 months, and lifetime doctor-diagnosed AE were 18.2%, 12.0%, and 2.8%, respectively. The prevalence of other AE-related symptoms is given in Table 1.

The prevalence of AE-related symptoms varied widely between the 32 districts. The rates of variation were high (range 0–17.2%) for doctor-diagnosed AE, with the lowest rates (<1.2%) in Adalar, Silivri, Bayrampasa, Buyukcekmece, and Catalca and the highest rates (>5%) in Maltepe, Beyoglu, Sile, Kagithane, and Besiktas. The prevalence of AE-related symptoms in various districts of Istanbul is shown in Table 2.

Risk Factors

Female sex (aOR = 1.45, 95% CI 1.12, 1.89), family history of atopy (aOR = 3.04, 95% CI 1.31, 7.06), watching television for more than 5 hours a day (aOR = 1.59, 95% CI 1.19, 2.11), and history of tonsillectomy (aOR = 2.10, 95% CI 1.30, 3.39) were independently associated with doctor-diagnosed AE in multivariate analysis.

There was no statistically significant difference between children with and without doctor-diagnosed AE according to the number of siblings living at home (uOR = 0.86, 95% CI 0.66, 1.12), being born in Istanbul (uOR = 0.95, 95% CI 0.74, 1.23), time lived in Istanbul (uOR = 1.54, 95% CI 0.81, 2.90), or presence of domestic pets at home during the last 12 months (overall: uOR = 0.93, 95% CI 0.69, 1.25; fish: uOR = 0.87, 95% CI 0.47, 1.58, dog:

TABLE 1. Prevalence of Atopic Eczema and Related Symptoms ($N = 9,991$)

Question	Female, n (%)	Male, n (%)	Total, n (%)
Itchy rash ever	879 (17.0)	942 (19.8)	1,821 (18.2)
Itchy rash in last 12 mos	630 (12.2)	574 (12.1)	1,204 (12.0)
Itchy rash with typical distribution	437 (8.5)	341 (7.2)	778 (7.8)
Itchy rash cleared completely in last 12 mos	400 (7.7)	386 (8.1)	786 (7.9)
Kept awake at night by this itchy rash in last 12 mos	697 (13.5)	274 (5.8)	971 (9.7)
Doctor-diagnosed eczema ever	164 (3.2)	117 (2.5)	281 (2.8)

TABLE 2. Summary of Self-Completed Atopic Dermatitis Data

Districts	12-mos prevalence					Doctor-diagnosed eczema ever, %	n
	Itchy rash ever, %	Itchy rash, %	Itchy rash with typical distribution, %	Healing in past year, %	Severe sleep disturbance due to itch, %		
Asian districts	17.6	11.3	7.5	7.5	5.5	3.8	3,588
Adalar	16.8	5.8	3.8	3.8	3.8	0	104
Beykoz	16.9	8.6	6.1	4.0	3.5	3.3	198
Kadikoy	14.8	9.9	7.2	7.2	6.0	2.0	484
Kartal	22.8	12.4	9.0	7.8	7.0	3.0	387
Maltepe	31.3	15.1	10.6	12.1	6.0	17.2	265
Pendik	21.4	11.3	9.1	7.4	6.6	3.6	408
Sultanbeyli	22.3	14.7	9.1	10.3	6.0	2.8	232
Sile	20.2	11.1	6.3	7.1	4.0	5.7	126
Tuzla	18.6	11.5	9.5	6.8	9.5	2.2	148
Umraniye	20.5	12.6	5.8	6.7	5.5	3.3	549
Uskudar	14.8	10.5	8.5	8.5	3.4	4.4	354
European districts	18.8	12.6	8.1	8.2	7.0	2.4	6,403
Avcilar	19.5	10.8	6.7	6.0	4.8	3.1	315
Bagcilar	16.7	11.4	7.5	7.0	6.2	1.9	612
Bahcelievler	20.9	12.6	7.9	7.6	6.0	2.5	381
Bakirkoy	19.4	9.1	7.3	6.9	5.6	1.8	232
Bayrampasa	24.8	16.7	10.8	12.3	8.8	1.0	204
Besiktas	15.0	8.6	4.1	5.4	3.6	5.6	222
Beyoglu	30.0	24.8	20.3	17.6	19.6	8.5	153
Buyukcekmece	20.2	12.0	5.0	7.0	7.7	1.1	416
Catalca	14.4	8.9	5.7	8.3	6.3	1.1	192
Eminonu	17.6	10.3	7.2	7.2	5.2	1.2	97
Esenler	21.4	11.2	6.4	7.1	5.9	1.3	409
Eyup	14.0	8.5	3.8	7.2	4.2	3.1	236
Fatih	19.8	14.2	9.9	8.8	9.9	1.7	374
Gaziosmanpasa	26.4	14.7	9.6	9.8	8.2	5.1	511
Gungoren	22.8	16.9	10.8	11.1	7.5	2.3	360
Kucukcekmece	20.4	11.6	7.5	6.0	6.5	1.5	664
Kagithane	20.1	14.1	6.4	10.3	7.7	5.2	311
Sariyer	22.6	15.5	10.0	10.3	8.0	4.3	399
Silivri	13.3	9.0	4.5	8.1	4.5	0.9	111
Zeytinburnu	16.0	10.9	9.1	5.7	6.5	1.8	230
Sisli	12.8	8.1	6.2	5.5	3.3	2.3	307
Total	19.9	12.2	7.9	7.9	6.5	3.1	9,991

uOR = 1.29, 95% CI, 2.10, and bird: uOR = 1.60, 95% CI 0.92, 2.79).

Although the presence of a cat at home during the last 12 months (uOR = 1.65, 95% CI 1.08, 2.54) and history of adenoidectomy (uOR = 2.15, 95% CI 1.45, 3.17) were independently associated with doctor-diagnosed AE in univariate analysis, these risk factors were not statistically significant in multivariate analysis. Risk factors affecting the prevalence of doctor-diagnosed AE are given in Table 3.

DISCUSSION

This study summarizes the prevalence of doctor-diagnosed AE and related symptoms in 13- to 14-year-old schoolchildren living in all 32 districts of Istanbul. This is the first study of the prevalence of AE covering all of the districts of Istanbul, which is the biggest and most crowded city in Turkey. There have been few

ISAAC studies showing the prevalence of AE in children ages 13 to 14 years performed in Turkey (5–7). This study differs from the former ones performed in Turkey because of the large number of children included.

Although the rate of doctor-diagnosed AE ever was similar to those in Denizli (2.1%) (5), Bursa (2.3%) (6), and Samsun (2.7%) (7), it was also low in comparison with the results of other countries, including Spain (13.3%) (8), Brazil (10.2%) (9), Latin America (10.4%) (10), and Africa (16.7%) (11).

The prevalence of AE-related symptoms varied widely between districts. The rate of variation was 4.3% for itchy rash in the last 12 months (range 5.8%–24.8%), with the lowest rates (<9%) in Adalar, Sisli, Eyup, Besiktas, Beykoz, Silivri, Bakirkoy, and Kadikoy and the highest (>15%) in Beyoglu, Gungoren, Bayrampasa, and Sariyer. The rates of doctor-diagnosed AE were high (range 0–17.2%), with the

TABLE 3. Risk Factors Affecting the Prevalence of Eczema

Factor	Children with doctor diagnosed atopic eczema, n (%)	Children without doctor-diagnosed atopic eczema, n (%)	Univariate OR (95% CI)	p	Multivariate adjusted OR (95% CI)	p
Sex*						
Female	164 (3.7)	4,323 (96.3)	1.50 (1.18, 1.91)	0.001	1.45 (1.12, 1.89)	0.004
Male	117 (2.5)	4,632 (97.5)	1.00		1.00	
History of family atopy*						
Yes	37 (6.5)	531 (93.5)	2.32 (1.62, 3.32)	<0.001	3.04 (1.31, 7.06)	0.001
No	240 (2.9)	7,995 (97.1)	1.00		1.00	
Hours of television watched per day*						
>5	81 (4.5)	1,704 (95.5)	1.65 (1.26, 2.14)	<0.001	1.59 (1.19, 2.11)	<0.001
≤5	206 (2.8)	7,140 (97.2)	1.00		1.00	
Number of siblings living at home						
1–2	211 (3.0)	6,821 (97.0)	0.86 (0.66, 1.12)	0.66		
≥3	79 (3.5)	2,192 (96.5)	1.00			
Location of school						
Asian side	136 (4.1)	3,176 (95.9)	1.62 (1.28, 2.05)	<0.001	1.55 (1.19, 2.02)	0.001
European side	154 (2.6)	5,837 (97.4)	1.00		1.00	
Born in Istanbul						
Yes	190 (3.1)	6,255 (96.9)	0.95 (0.74, 1.23)	0.72		
No	86 (3.2)	2,592 (96.8)	1.00			
Years lived in Istanbul						
>5	258 (3.1)	8,103 (96.9)	1.54 (0.81, 2.90)	0.81		
≤5	10 (2.0)	483 (98.0)	1.00			
Presence of domestic animals at home during last 12 mos						
Yes	58 (2.9)	1,916 (97.1)	0.93 (0.69, 1.25)	0.64		
No	221 (3.1)	6,880 (96.9)	1.00			
Presence of pet fish at home during last 12 mos						
Yes	15 (2.7)	531 (97.3)	0.87 (0.47, 1.58)	0.60		
No	40 (3.1)	1,222 (96.8)	1.00			
Presence of cat at home during last 12 mos						
Yes	24 (4.7)	488 (95.3)	1.65 (1.08, 2.54)	0.02	1.52 (0.97, 2.38)	0.07
No	242 (2.9)	8,149 (97.1)	1.00		1.00	
Presence of dog at home during last 12 mos						
Yes	18 (3.7)	471 (96.3)	1.29 (0.79, 2.10)	0.30		
No	240 (2.9)	8,113 (97.1)	1.00			
Presence of pet bird at home during last 12 mos						
Yes	34 (3.7)	884 (96.3)	1.60 (0.92, 2.79)	0.09		
No	21 (2.3)	877 (97.7)	1.00			
History of tonsillectomy						
Yes	40 (6.6)	562 (93.4)	2.39 (1.69, 3.38)	<0.001	2.10 (1.30, 3.39)	0.02
No	236 (2.9)	7,972 (97.1)	1.00		1.00	
History of adenoidectomy						
Yes	30 (6.2)	456 (93.8)	2.15 (1.45, 3.17)	<0.001	1.12 (0.64, 1.97)	0.68
No	247 (3.0)	8,064 (97.0)	1.00		1.00	

OR, odds ratio; CI, confidence interval. *p < 0.05 is considered significant.

lowest rates (<1.2%) in Adalar, Silivri, Bayrampasa, Buyukcekmece, and Catalca and the highest rates (>5%) in Maltepe, Beyoglu, Sile, Kagithane, and Besiktas. The prevalence of AE-related symptoms according to district of Istanbul are given in Table 2. The wide variation between the districts may be due to environmental, socioeconomic, and genetic factors. Istanbul is largely populated by migrants from eastern Turkey seeking employment and better living conditions, which may cause genetic heterogeneity among inhabitants. Most of the business areas and abundant housing are located on the European side. The Asian side is quieter than the European side. Because each

district has its own social, economic, and geographical features, there is a complex interaction of multiple factors in each district.

Risk Factors

We focused in particular on doctor-diagnosed AE when we were evaluating the risk factors. This non-ISAAC question was chosen instead of the others as the outcome. A history of doctor-diagnosed AE best represents AE. Itchy rash as a single symptom is less specific than doctor-diagnosed AE since it might be confused with other itchy skin rashes such as hives,

scabies, fungal infections, and contact dermatitis. It would be interesting to assess data also for itchy rash ever and 12-month itchy rash and to compare them, but that is beyond the scope of this article. As expected, we found atopic heredity to be the most prominent risk factor for doctor-diagnosed AE.

Results regarding the relationship between AE and sex are controversial. Some studies have suggested that sex is not associated with AE risk (2), whereas others have shown that female (9) or male sex (16) is associated with AE risk. In the present study, the prevalence of doctor-diagnosed AE in girls was higher than in boys (aOR = 1.45). This could be related to differences in skin care or other exposures.

Watching television for more than 5 hours a day may be evidence of a sedentary lifestyle and may cause obesity (13,17). The association between obesity and television viewing and the risk of eczema have rarely been examined. One study reported that viewing television for 5 or more hours per day was associated with greater risk of eczema symptoms for children ages 13 to 14 than watching for less than 1 hour (18). We found that watching television for more than 5 hours a day was a significant risk factor for doctor-diagnosed AE. Further research aimed at elucidating the relationship between sedentary lifestyle and AD is required.

The effect of cat and dog exposure on the development of allergic disease remains controversial (19, 20). In our study, doctor-diagnosed AE was more common in children who had owned cats, but the difference was not significant.

The prevalence of doctor-diagnosed AE in schools on the Asian side was significantly higher than on the European side (aOR = 1.55, 95% CI 1.19, 2.02). The results of this study may offer an opportunity for investigation of possible causative factors for AE and related symptoms in districts with a high prevalence.

Tonsils and adenoids are involved in the defense against antigens and alimentary microorganisms (21). Surgical removal of adenoid or tonsil tissue may result in lower humoral and cellular responses and thus may reduce stimulation of the immune system in young children (22). This might lead to greater risk of atopic disease in later life. Both our study and the study of Sult  sz et al (23) may support the hypothesis that tonsillectomy is associated with AE, although van Hattum et al (24) found no relationship between adenoidectomy and tonsillectomy in childhood and the incidence of atopic diseases at adolescence. There may also be other potential confounders.

Other risk factors, including being born in Istanbul, time lived in Istanbul, presence of pets (fish, cat,

dog and bird) at home, and adenoidectomy history were not associated with the prevalence of doctor-diagnosed AE.

There are several strengths of this study. First, the ISAAC questionnaire used in this study has been validated worldwide. Our data can easily be compared with those of other studies conducted using the ISAAC questionnaire since they share the same standardized methodology. Second, the total number of questionnaires filled out from different districts reflects the entire target population of the city. A weakness of this study is that neither we nor our Turkish colleagues have validated the ISAAC protocol questions, but translation of the phrases would not cause a great enough discrepancy to influence our results since people fluent in Turkish and English performed the translation, and there were no "vague phrases" that could cause major interobserver variability in the translation. Another weakness of the study is that the data are based on children's reports; there were no objective data such as physical examination for confirmation of the diagnosis.

In conclusion, the present study summarized the prevalence of doctor-diagnosed AE and related symptoms in 13- to 14-year-old schoolchildren living in all districts of Istanbul. Female sex, a family history of atopic disease, watching television for more than 5 hours a day, and a history of tonsillectomy may be considered potential risk factors for AE in children.

REFERENCES

1. Asher MI, Keil U, Anderson HR et al. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. *Eur Respir J* 1995;8:483-491.
2. Asher MI, Weiland SK. The International Study of Asthma and Allergies in Childhood (ISAAC). *Clin Exp Allergy* 1998;28(Suppl 5):52-66.
3. Baron SE, Cohen SN, Archer CB. British Association of Dermatologists and Royal College of General Practitioners. Guidance on the diagnosis and clinical management of atopic eczema. *Clin Exp Dermatol* 2012;37:7-12.
4. Williams HC, Robertson CF, Stewart AW 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;103:125-138.
5. Akcay A, Tamay Z, İnan M et al. Denizli'deki 13-14 ya  okul  ocuklarında alerjik hastalık belirtilerinin yaygınlığı. *Turk Arch Pediatr* 2006;41:81-86.
6. Canitez Y, Sapan N. The prevalences of asthma, allergic rhinitis, and eczema in Bursa, Turkey: an ISAAC study. *J Allergy Clin Immunol* 2000;105:318.
7. Anlar FY, Sancak R, Ozt  rk F. Childhood allergic disorders in Samsun, Turkey: discrepancy between

- reported and diagnosed. *Pediatr Allergy Immunol* 2006;17:635–638.
8. Morales Suárez-Varela M, García-Marcos L, Kogan MD 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;36:336–342.
 9. Solé D, Camelo-Nunes IC, Wandalsen GF et al. Prevalence of atopic eczema and related symptoms in Brazilian schoolchildren: results from the International Study of Asthma and Allergies in Childhood (ISAAC) phase 3. *J Investig Allergol Clin Immunol* 2006;16:367–376.
 10. Solé D, Mallol J, Wandalsen GF et al. Latin American ISAAC Phase 3 Study Group. Prevalence of symptoms of eczema in Latin America: results of the International Study of Asthma and Allergies in Childhood (ISAAC) Phase 3. *J Investig Allergol Clin Immunol* 2010;20:311–323.
 11. Zar HJ, Ehrlich RI, Workman L et al. The changing prevalence of asthma, allergic rhinitis and atopic eczema in African adolescents from 1995 to 2002. *Pediatr Allergy Immunol* 2007;18:560–565.
 12. Levy RM, Gelfand JM, Yan AC. The epidemiology of atopic dermatitis. *Clin Dermatol* 2003;21:109–115.
 13. Deigpen TL. Is the prevalence of atopic dermatitis increasing? In Williams HC, ed. *Atopic dermatitis*. Cambridge: Cambridge University Press, 2000:96–109.
 14. Silverberg JI, Silverberg NB, Lee-Wong M. Association between atopic dermatitis and obesity in adulthood. *Br J Dermatol* 2012;166:498–504.
 15. Republic of Turkey, Prime Ministry Turkish Statistical Institute (TURKSTAT). Available at <http://www.die.gov.tr/> (accessed March 23, 2012).
 16. Choi WJ, Ko JY, Kim JW et al. Prevalence and risk factors for atopic dermatitis: a cross-sectional study of 6,453 Korean preschool children. *Acta Derm Venereol* 2012;92:467–471.
 17. Shamssain MH, Shamsian N. Prevalence and severity of asthma, rhinitis, and atopic eczema: the North East Study. *Arch Dis Child* 1999;81:313–317.
 18. Dietz WH Jr, Gortmaker SL. Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. *Pediatrics* 1985;75:807–812.
 19. Mitchell EA, Beasley R, Björkstén B et al. ISAAC Phase Three Study Group. The association between BMI, vigorous physical activity and television viewing and the risk of symptoms of asthma, rhinoconjunctivitis and eczema in children and adolescents: ISAAC Phase Three. *Clin Exp Allergy* 2013;43:73–84.
 20. Chen CM, Tischer C, Schnappinger M et al. The role of cats and dogs in asthma and allergy—a systematic review. *Int J Hyg Environ Health* 2010;213:1–31.
 21. Van Kempen MJ, Rijkers GT, Van Cauwenberge PB. The immune response in adenoids and tonsils. *Int Arch Allergy Immunol* 2000;122:8–19.
 22. Saito H, Asakura K, Hata M et al. Does adenotonsillectomy affect the course of bronchial asthma and nasal allergy? *Acta Otolaryngol Suppl* 1996;523:212–215.
 23. Sultész M, Katona G, Hirschberg A et al. Prevalence and risk factors for allergic rhinitis in primary schoolchildren in Budapest. *Int J Pediatr Otorhinolaryngol* 2010;74:503–509.
 24. van Hattum ES, Balemans WA, Rovers MM et al. Adenoidectomy and/or tonsillectomy in childhood is not associated with atopic disease later in life. *Clin Exp Allergy* 2006;36:40–43.