

Prevalence of Atopic Dermatitis Symptoms among Students in Kurdistan: a North-west Province of Iran

Rasoul Nasiri kalmarzi¹, Pedram Ataee², Ghazaleh Homagostar³, Majid Tajik³, Ali Shekari⁴, Daem Roshani⁵, Vahid Ghobadi Dana⁶, *Sairan Nili⁷

¹ Associate Professor, Allergy and Immunology Department, Kurdistan University of Medical Sciences, Sanandaj, Iran.

² Associate Professor, Department of Pediatrics, Best Hospital, Kurdistan University of Medical Sciences, Sanandaj, Iran.

³ Medical Students, School of Medicine, Kurdistan University of medical Sciences, Sanandaj, Iran.

⁴ MD, Kurdistan University of Farhangian, Sanandaj, Iran.

⁵ Associate Professor, Social Determinants of Health Research Center, Kurdistan University of Medical Sciences, Sanandaj, Iran.

⁶ Tehran University of Medical Sciences, Tehran, Sanandaj, Iran.

⁷ Epidemiology MSc, Department of Disease Prevention of Health Deputy, Kurdistan University of Medical Science, Sanandaj, Iran.

Abstract

Background

Atopic dermatitis (AD), often called eczema or atopic eczema is a very common skin disease; AD looks different in infants, children, and adults. The aim of this study was to determine the prevalence of the disease in Kurdistan province.

Materials and Methods

Cross-sectional study using written questionnaires ISAAC where 4,000 students in two age groups 7-6 and 14-13 years in the province were using multi-stage sampling was carried out so that the first two floors rural and urban communities in every city and in every school pupil samples were selected based on 8-digit code.

Results

The prevalence of itchy rashes in the past 6 months, itchy rashes in the past 12 months and rashes at flexural areas were 7.5%, 8.9%, and 10.3%, respectively; the prevalence was higher in 13-14 years old than 6-7 years old and was higher in boys than in girls (Odds Ratio (OR)=1.44, Confidence interval (CI)= 1.49-2, P <0.001).

Conclusion

The prevalence of itchy rashes in the past 12 month was 8.9% and it was more prevalent in boys than the girls were and in age group 13-14 years old was higher than in 6-7 years old.

Key Words: Atopic, Dermatitis, Iran, Students.

*Please cite this article as: Nasiri kalmarzi R, Ataee P, Homagostar Gh, Tajik M, Shekari A, Roshani D, et al. Prevalence of Atopic Dermatitis Symptoms among Students in Kurdistan: a North-west Province of Iran. *Int J Pediatr* 2016;4(1): 1205-14.

*Corresponding Author:

Sairan Nili, Kurdistan University of Medical Sciences, Abider Street, Sanandaj, Iran. Postal code: 66186-34683, fax: +00 98 87 33237760.

Email: nele_sayran@yahoo.com

Received date: Aug 21, 2015 Accepted date: Sep 22, 2015

1- INTRODUCTION

Eczema or atopic dermatitis is one of the most common skin diseases in the world(1), particularly in neonates and children (2) and its symptoms are itching and eczema. Although this disorder is not fatal, it can lead to skin damages, secondary infections, sleep disorders in children and parents(3), reduced quality of life (4), high costs(5), loss of confidence, and reduced functional capacity that can interfere athletic activities and social relationships(6). The economic burden of eczema is similar to that of asthma (7) and in its severe and moderate forms it imposes a level of stress to families that is more than the stress caused by caring for a child with type I diabetes mellitus(8). Studies have shown that the stress caused by this disease can lead to increased levels of eosinophils, subpopulation lymphocytes, and natural killer cells (4).

Several studies state that genetic and environmental factors involved in the pathogenesis of atopic dermatitis(9). AD is an important public health problem(10), and there has been a significant increase in the prevalence of disease in industrialized countries during the past three decades (11) which has affected 1% to 5% of the general population, 2% to 10% of adults, and 5% to 30% of children(11-13).

Higher prevalence of AD in urban areas is attributed to better health condition that reduces the level of exposure to infections in early childhood and increase the sensitivity to allergic diseases (11, 14). Increased exposures to various infections and endogenous allergens, reduced level of breastfeeding, and more awareness about atopic dermatitis have led to the increased prevalence of the disease(15). In terms of etiology of the disease, the progress of AD is under the influence of both genetic factors (16) and also environmental factors such as diet, climate, infections, atmosphere pollutions, ozone, nitrogen

monoxide, Particulate. Matter less than 10 (PM10), and songorine (SO₂, 10 and 30 μm) (13, 17). The prevalence of AD is reported to be 17.2% in American children(18), 15.6% in European Children(19), 24% in Japanese children aged 5-6 years old (20), 19.1% in Korea, and 20% in other countries(21). Investigations on more than half a million children in the world in the first phase of the ISAAC study showed that the disease is a prevalent disease, and the range of its prevalence varies from less than 2% to 20%(22). It is notable that the disease has had a rising trend in recent decades (23-25); probably, air pollution, increased education levels, and increased social levels may increase the risk of AD. Previous studies have shown that individuals with AD are more likely to develop asthma; furthermore, there is a better prognosis of asthma in patients without a history of AD (26).

Kurdistan province has an area of 28,203 km² and is located in western part of Iran at 34 degrees 44 minutes and 36 degrees 30 minutes of north latitude and 45 degrees 31 minutes and 48 degrees 16 minutes of east longitude of the Greenwich meridian. With regard to climatic and geographical conditions, the province has the features of a middle cool climate and its height difference is about 3,290 meters (27) (Figure.1). The knowledge about the prevalence of the disease can be used to prioritize health care issues and utilized as a guide for identifying possible environmental factors which can cause dermatitis, and finally it can be helpful for public health planning.

2- MATERIALS AND METHODS

2-1: Methods

This cross-sectional study was conducted during September 2013 to June 2014. Using the written questionnaire of the first phase of the ISAAC, this study was conducted on 4,000 students at the

two age groups of 6-7 and 13-14 years old in Kurdistan province-Iran. In this survey the response rate was about 97% and 3,890 people participated in the study. The prevalence of symptoms was calculated via dividing positive responses by the total number of questions answered. Sensitivity and specificity of the questions 2 and 3 (rashes in the past 12 months and rashes in flexural areas) were, respectively, 84% and 93% in the United Kingdom study (28) and 74% and 98% in Romania study(29).

Validity and reliability of the Persian version of the questionnaire have been measured in previous studies (30). The repeatability of the questions was high and Kappa value was equal to 0.86 (28). This study was the result of a research project which was approved by the Research deputy of Kurdistan University of Medical Sciences and approved by the Ethics Committee (ID: MUK.REC.1392.61).

2-2: Subject

The study subjects included 1,768 students aged 6-7 years old and 2,122 students aged 13-14 years old, which were respectively selected from students at the first grade and eighth grade, respectively.

To generalize the results, the sample size was determined in proportion with the number of students in each city by sex and age. Sampling was carried out via a multi-stage method. The samples were selected using the table of random numbers and based on the 8-digit codes of students they had received at the time of registration.

After coordination with the provincial education department and communicated to the schools under study, researchers presented letters referred to schools according to ISAAC protocol, after obtain informed consent, in the age group 6-7 years parents completed old the questionnaires while in the age group 13-14 years old the students themselves completed them. Based on ISSAC

protocol, after distributing the questionnaires, each question was explained by a trained interviewer.



Fig.1: Kurdistan province

2-3: Statistical analysis

The data collected based on ISSAC standards were entered into SPSS-16 statistical software in two separate sheets by two persons. Descriptive analysis was performed. P values less than 0.05 were significant. To investigate the relationship between symptoms of dermatitis, gender, and educational level, the analysis was carried out using the Chi-square test, and its odds ratio (OR) and confidence interval of 95% were calculated. Based on ISSAC protocol, the analysis of the two age groups of 6-7 and 13-14 years were performed separately.

3- RESULTS

The results showed that the prevalence of itchy rashes in the past 6 months, itchy rashes in the past 12 months, and rashes at flexural areas were 7.5%, 8.9%, and 10.3%, respectively and they were more prevalent in boys than in girls. In this study, the prevalence of eczema in both

age groups was higher in boys and this difference was statistically significant (OR=1.44, CI: 1.49-2, P <0.001). In addition, the prevalence of symptoms in age group 13-14 years old was higher (Table.1). Of all, 5.9% of boys and 6.5% of girls had a severe form of the disease, which was statistically significant

(P <0.003) (Table.2). The Odd ratio of asthma in patients with eczema was 1.068, CI: .742-1.539 and in patients with rhinitis it was 0.9, CI: .77-1.269. The prevalence rate was particularly diverse in different districts of the province (Figure.2).

Table 1: Prevalence of symptoms of atopic dermatitis, by age group and gender

Variables	N (%)	OR	CI	P
Male	1809(46.6)			
Female	2069(53.4)			
Elementary school (6-7 years old)	1788(45.5)			
Junior high school (13-14 years old)	2122(54.6)			
Recurrent itchy rashes for at least 6 months	11.96%	1.363	1.122-1.655	.002
(6-7 years old) Male	9.70%	1.557	1.162-2.084	.003
Female	5.60%			
(13-14 years old) Male	8.40%	1.317	.937-1.581	.145
Female	6.50%			
Itchy rashes during 12 past months	8.90%	1.293	1.035-1.615	0.027
(6-7 years old) Male	10.58%	1.455	1.046-2.025	.026
Female	7.50%			
(13-14 years old) Male	9.40%	1.176	.869-1.591	.318
Female	8.86%			
Itchy rashes on flexural areas	6.6%	1.32	1.024-1.72	.033
(6-7 years old) Male	7.79%	1.325	.913-1.92	.148
Female	6%			
(13-14 years old) Male	7.33%	1.335	.94-1.89	.112
Female	5.92%			
History of eczema	37.6%	1.44	1.49-2	.000
(6-7 years old) Male	37.2%	1.85	1.15-1.8	.001
Female	29%			
(13-14 years old) Male	49.5%	1.72	1.51-2.26	.000
Female	34.6%			

Table 2: Prevalence of sleep disorders due to itchy rashes, by age groups and gender

Variables	Never during the past 12 months N (%)	Less than one night a week	One or several nights a week	P value
Sleep disorders due to itchy rashes	102(58.4)	621(35.4)	109(6.2)	
(6-7 years old) Male	178(52.7)	142(42)	18(5.3)	.052
Female	271(60.4)	151(33.6)	28(6.2)	
(13-14 years old) Male	285(56)	192(37.7)	32(6.3)	.035
Female	289(63.4)	136(29.8)	31(6.8)	
Total Male	463(54.7)	334(39.4)	847(5.9)	.003
Female	560(61.8)	287(31.7)	59(6.5)	

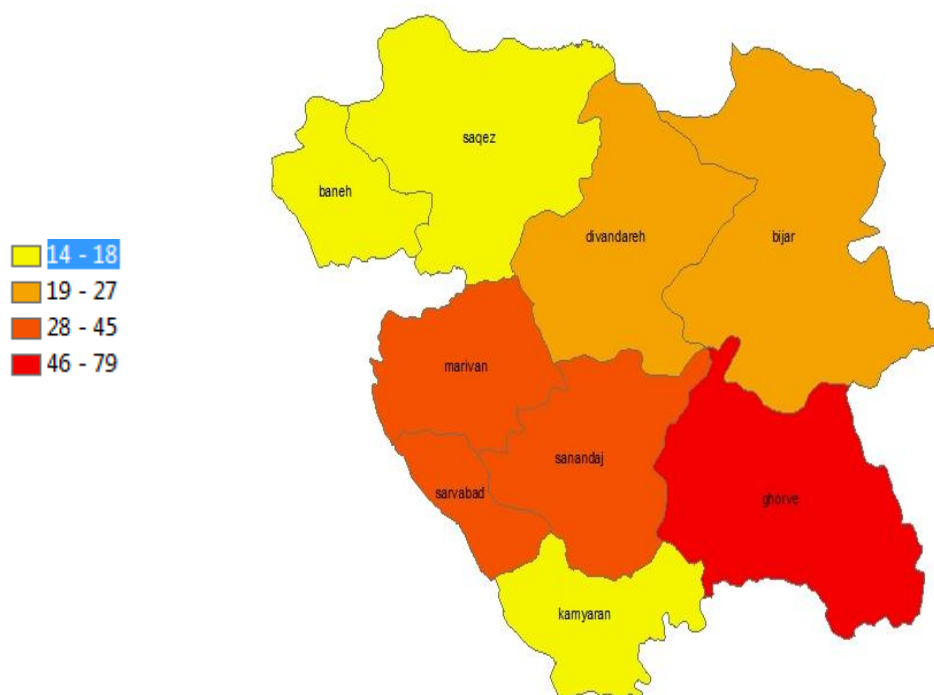


Fig.2: Distribution of the prevalence of eczema in districts of Kurdistan province

4- DISCUSSION

Of all people, 8.9% of the subject in this study reported itchy rashes in the past 12 month, it was more prevalent among the age group 13-14 years old, and there was a significant difference between the two sexes. In addition, the prevalence of symptoms in age group 13-14 years old was higher than in age group 6-7 years old. Mean prevalence of symptoms of eczema is 7.6% (from 0.1 to 19.9) in the world and its prevalence among children aged 13-14 years old is 2.6% (22, 31), however, in another study it is reported as 13.7% (from 1.6% to 39.7%)(32). According to the results of international ISAAC study, the prevalence of symptoms of atopic eczema was higher in girls in both age groups; moreover, with increasing the prevalence of atopic eczema, was this ratio raised more. The prevalence of symptoms in the age group 6-7 years old was more than the age group 13-14 years old(33). The prevalence of the disease is reported to be 7.55% in Croatia(34) , 15% in Yazd(35),

18.3% in Shiraz (in Center of Iran)(36), 14% in Birjand (in Eastern part of Iran)(37), and 15.6% in Bushehr (in Southern part of Iran)(38); similar to our results, in Bushier the disease was more prevalent in the age group 13-14 years old which may be due to the higher levels of fast food consumption and other nutritional factors in this age group(39).

The prevalence of AD in children 7-12 years old in Kerman (in Southeast of Iran) in girls and boys was, respectively, 8.33% and 9.09% ($P > 0/05$) (40).

The prevalence of disease has been reported 3.9% in Ahvaz (41) and 2.1% in Shahrekord(42). The highest levels of prevalence in the world are reported in urban areas in Africa, Australia, Northern and Western Europe (more than 15%) and the lowest levels are reported in China, Eastern Europe, and Central Asia (less than 5%) (43, 44). In a study in Brazil, of all the subjects, 8.2% had atopic dermatitis, 11.5% had eczema symptoms in the past 12 months, and 5% were

suffering from severe eczema (45) and the results are almost consistent with the results of the present study.

The distribution of the prevalence of atopic dermatitis in the province shows varieties in the prevalence rates in the province (Figure. 2) which is almost in line with the climate conditions in different districts of the province. Kurdistan is under the influence of two important hot and cold air flows which create different climates. The highest amount of rainfall is observed in the Western part of the province (in Bane and Marivan) with 800 mm per year, and the lowest rainfall is observed in the eastern part of the province (in Ghorveh and Bijar) with 400 mm per year. The rainfall in the central part of the province (in Saghez and Sanandaj) is about 500 mm per year. In Northern parts of Brazil, there was an association between the incidence of eczema in children and higher temperatures. In Nigerian children, heat, extra sweating, and humidity were among the predisposing factor for AD (46) and similar findings are also noted in other clinical trials (47). The prevalence of eczema symptoms is also associated with latitude and mean temperature; as a result climate plays an important role in the prevalence of the disease(48).

A study in Spain has reported air pollution as one of the factors influencing the increase of AD in adults (49). Allergic diseases are increasing throughout the world and such an increase is associated with climate conditions, nutritional changes that move toward westernization, and environmental factors resulting from industrial pollution (50). In European countries the prevalence of symptoms of eczema in both groups is positively associated with the increase in height and negatively associated with the increases in annual mean temperature. Symptoms of eczema in the age group 6-7 years old are negatively associated with relative indoor temperature. Indeed, height and

temperature are indirectly correlated with changes in behaviors and exposures to sunlight. Moreover, the impact of relative indoor humidity is also suggested by some other studies. Several studies have shown that climate and pollutions are the most important environmental factors affecting the disease(51, 52).

Higher prevalence rates in urban areas and among higher socioeconomic classes suggest that antigenic pollutions and lack of exposure to infectious agents and other antigenic triggers in early childhood are effective in the development of AD (28, 53). Being affected by the severe form of dermatitis in boys aged 6-7 years was 5.3% while in girls it was 6.2%; moreover, in the age group 13-14 years old they were 6.3% and 6.8%, respectively, and the difference between the sexes was significant ($P < 0.003$).

The prevalence of severe atopic eczema symptoms ranged from 0% to 3.2% in the age group 6-7 years and from 0% to 5.1% in the age group 13-14 years old (33). The prevalence of the severe form of the disease is reported 5% in Brazil (45) and 1.5% in Taiwan(54).

Of all, 3.9% of patients reported a history of asthma and 9.37% had a history of hay fever. The Odd ratio of asthma in patients with dermatitis was 1.068, CI: .742-1.539 and in patients with rhinitis it was 0.9, CI: .77-1.269. The risk of asthma attributable to atopic dermatitis is estimated to be around 30% (55). In Bazazi's study in Gorgan (in North part of Iran), both the history of rhinitis in the past 12 months and eczema were associated with asthma ($P < 0.05$)(32). In a study that was conducted in Bushier, there was no association between environmental factors and atopic dermatitis; however, there was an association between allergic rhinitis and asthma(38). In a study in Kerman, 3.79% of participants reported a history of asthma and rhinitis. Among allergic diseases, the

two diseases of atopic dermatitis and asthma are associated with each other; however, dermatitis does not necessarily lead to the development of asthma.

Eczema during infancy is one of the most important risk factors for asthma and rhinitis. In addition, rhinitis and atopic dermatitis are more reported in patients with asthma. In a study on patients with atopic dermatitis after eight years 43% are affected with asthma and 45% with allergic rhinitis (29). Atopic march is the natural course of atopic symptoms that is characterized by the sequence of typical clinical symptoms of atopic diseases. Clinical symptoms of AD are the predictors of the onset of asthma and rhinitis. AD is recognized as the entry point for allergic diseases(26).

Limitations: The possibility of recall bias and lack of additional tests to diagnose the disease and calculate the exact values are among the limitations of this study.

5- CONCLUSION

The results of this study show that in the mountainous districts that has a cold climate and high humidity are and they are also more high prevalence of atopic dermatitis. The lack of parent's attention to keep track of dermatitis in early childhood can predispose to more severe cases in older adolescents. Growing tendency in Western nutrition is another cause of the increased prevalence of the disease in children and adolescents.

Recommendations: This study was merely aimed to determine the prevalence and distribution of atopic dermatitis in Kurdistan, a North-west Province of Iran. Hence it is recommended to conduct further studies on risk factors of the disease and use the results for better implementation of effective interventions.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENT

This study was the result of a research project approved by the Research Deputy of Kurdistan University of Medical Sciences and it was conducted under its financial support. We would like to appreciate those who paid special attention to this project

8- REFERENCES

1. McNally N, Phillips D. Geographical studies of atopic eczema. In: Williams HC, editor. Atopic dermatitis—the epidemiology, causes and prevention of atopic eczema. Cambridge: Cambridge University Press; 2000. p. 71-84.
2. Kay J, Gawkrödger DJ, Mortimer MJ, Jaron AG. The prevalence of childhood atopic eczema in a general population. *Journal of the American Academy of Dermatology* 1994;30(1):35-9.
3. Reid P, Lewis-Jones M. Sleep difficulties and their management in preschoolers with atopic eczema. *Clinical and Experimental Dermatology* 1995;20(1):38-41.
4. Schmid-Ott G, Jaeger B, Adamek C, Koch H, Lamprecht F, Kapp A, et al. Levels of circulating CD8+ T lymphocytes, natural killer cells, and eosinophils increase upon acute psychosocial stress in patients with atopic dermatitis. *Journal of allergy and clinical immunology* 2001;107(1):171-77.
5. Su JC, Kemp AS, Varigos GA, Nolan TM. Atopic eczema: its impact on the family and financial cost. *Archives of disease in childhood* 1997;76(2):159-62.
6. Paller AS, McAlister RO, Doyle JJ, Jackson A. Perceptions of physicians and pediatric patients about atopic dermatitis, its impact, and its treatment. *Clin Pediatr (Phila)* 2002;41:323-32.
7. Verboom P, Hakkaart-Van L, Sturkenboom M, De Zeeuw R, Menke H, Rutten F. The cost of atopic dermatitis in the Netherlands: an international comparison. *Br J Dermatol* 2002;147:716-24.

8. Kemp AS. Cost of illness of atopic dermatitis in children: a societal perspective. *Pharmacoeconomics* 2003;21:105-13.
9. Sanchita, B. Atul .B, Meta-analysis of atopic dermatitis studies (HUMIP. 269). *The Journal of Immunology* 2015;194(1): 52.18-52.18
10. Bieber T. Atopic dermatitis-clinical and pathophysiological aspects. *Eur Dermatol Rev* 2007;(1):13–15.11. Bieber T. Atopic dermatitis. *N Engl J Med* 2008;358(14):1483–1494.
12. Hurwitz S. Eczematous eruptions in childhood. In: Hurwitz S, ed. *Clinical Pediatric Dermatology*. Philadelphia: Saunders; 1993:45–6.
13. Isolauri E, Su'tas Y, Ma'kinen-Kiljunen S, Oja SS, Isosomppi R, Turjanmaa K. Efficacy and safety of hydrolyzed cow milk and aminoacid-derived formulas in infants with cow milk allergy. *J. Pediatr* 1995;127(4):550 –557.
14. Carroll CL, Balkrishnan R, Feldman SR, Fleischer AB Jr, Manuel JC. The burden of atopic dermatitis: Impact on the patient, family, and society. *Pediatr Dermatol* 2005;22(3):192–99.
15. Boguniewicz M, Leung DYM. Atopic dermatitis. In: Middleton E, Reed CE, Ellis EF, Adkinson NF Jr, Yanginger JW, Busse WW, eds. *Allergy Principles and Practice*. St. Louis: Mosby; 1998:1123–34.
16. Barnetson R St C, Rogers M. Childhood atopic eczema. *BMJ* 2002; 324(7350):1376–79.
17. Boquete M, Almunia C. Dermatitis atópica: nuevas consideraciones. *Bol Pediatr* 2007; 47(199):4-14.
18. Laughter D, Istvan JA, Tofte SJ, Hanifin JM. The prevalence of atopic dermatitis in Oregon schoolchildren. *Journal of the American Academy of Dermatology* 2000;43(4):649-55.
19. Larsen FS, Diepgen T, Svensson Å. The occurrence of atopic dermatitis in north Europe: an international questionnaire study. *Journal of the American Academy of Dermatology* 1996;34(5):760-64.
20. Sugiura H, Umemoto N, Deguchi H, Murata Y, Tanaka K, Sawai T, et al. Prevalence of childhood and adolescent atopic dermatitis in a Japanese population: comparison with the disease frequency examined 20 years ago. *Acta Dermatovenereologica-stockholm* 1998;78:293-94.
21. Calidad del aire de fondo regional en España para protección de la salud: Contaminación por ozono (O3) y partículas (PM10). In: Banco público de indicadores ambientales del Ministerio de Medio Ambiente. Ministerio de Medio Ambiente, 2007.
22. Williams H, Robertson C, Stewart A, Ait-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. *Journal of allergy and clinical immunology* 1999;103(1):125-38.
23. O'Connell EJ. The burden of atopy and asthma in children *Allergy* 2004;59(suppl 78):7-11.
24. Sturgill S, Bernard LA. Atopic dermatitis update. *Curr Opin Pediatr* 2004;16:396-401.
25. Schultz LF, Hanifin J. Secular change in the occurrence of atopic dermatitis. *Acta derm-venereol Suppl(stockh)* 1992;176:7-12.
26. Spergel JM, Paller AS. Atopic dermatitis and the atopic march. *Journal of Allergy and Clinical Immunology* 2003;112(6):S118-S27.
27. <https://fa.wikipedia.org/wiki/Kurdistan>. oldid:16345082/2016.1.1
28. Wuthrich B. Clinical aspects, epidemiology, and prognosis of atopic dermatitis. *Ann Allergy Asthma Immunol* 1999;83:464-70.
29. Gustafsson D, Sjoberg O, Foucard T. Development of allergies and asthma in infants and young children with atopic dermatitis: a prospective follow-up to 7 years of age. *Allergy* 2000;55:240-5.

30. Masjedi M, Fadaeizadeh L, Najafizadeh K, Doukouhaki P. A Study Of The Prevalence And Severity Of Rhinitis In Children In Tehran: Isaac Study. *Journal of Isfahan Medical School (IUMS)*. 2005.
31. Weiland S, Hüsing A, Strachan D, Rzehak P, Pearce N. Climate and the prevalence of symptoms of asthma, allergic rhinitis, and atopic eczema in children. *Occupational and environmental medicine* 2004;61(7):609-15.
32. Bazzazi H, Gharagozlou M, Kassaiee M, Parsikia A, Zahmatkesh H. The prevalence of asthma and allergic disorders among school children in Gorgan. *Journal of research in medical sciences* 2007;12(1):28-33.
33. Williams H, Robertson C, Stewart A, Ait-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.
34. H. Munivrana Skvorca, D. Plavec, S. Munivrana, M. Skvorca, B. Nogaloe, M. Turkalj. Prevalence of and risk factors for the development of atopic in schoolchildren age 12-14 in northwest Croatia. *Allergologia et immunopathologia*. 2014;42(2):142-148.
35. Karimi M, Mirzaei M, Ahmadi M. Prevalence of Asthma, Allergic rhinitis and Eczema symptoms among 13-14 year-old school children in Yazd in 2003. *J Ahvaz Uni Med Sci* 2007;6:270-75.
36. Hassanzadeh J, Basiri F, Mohammad-Beigi A. Prevalence of asthma symptoms and allergic diseases with ISSAC method in children, Shiraz 2009. *Zahedan Journal of Research in Medical Sciences* 2012; 13(8): 35-9.
37. Mortazavi Moghaddam, AR SJ. Prevalence of Asthma symptoms among 13-14 years old children in Birjand. *J Zahedan Univ Med Sci (Tabib-e-shargh)* 2004;6:183-91.
38. Hatami G AAE, Najafi A, Razavi Sh, Afrasiabi K AM, Yarandi AR, Rasapour, Meer-Alai A. Prevalence of Asthma and Asthma-related symptoms among 13-14 yr school children in Bushehr, ISSAC. *Iranian South Med J* 2002; 2(5): 167-75.
39. Farrokhi S, Gheybi MK, Movahhed A, Dehdari R, Gooya M, Keshvari S, et al. Prevalence and Risk Factors of Asthma and Allergic Diseases in Primary Schoolchildren Living in Bushehr, Iran: Phase I, III ISAAC Protocol. *Iranian Journal of Allergy, Asthma and Immunology* 2014;13(5):348-55.
40. Farajzadeh S, Esfandiarpour I, Sedaghatmanesh M, Saviz M. Epidemiology and Clinical Features of Atopic Dermatitis in Kerman, a Desert Area of Iran. *Annals of dermatology* 2014;26(1):26-34.
41. Moosavi Z, Samadzadeh D. Prevalence of atopic dermatitis in 7-11 year old school children, Ahwaz. *J Shahid Sadoughi University Med Sci* 2006;14:38-44.
42. Afshari F, Khadivi R, Shirzad H. Factors influencing atopic dermatitis in school children of Shahrekord. *J Shahrekord Univ Med Sci* 2007;8:71-8.
43. Lis G, Breborowicz A, Cichocka-Jarosz E, Sobkowiak P, Gazurek D, Swiatly A, et al. The prevalence of allergic rhinitis and conjunctivitis in school children from Krakow and Poznan-ISAAC study (International Study of Asthma and Allergies in Childhood). *Otolaryngologia polska The Polish otolaryngology* 2003;58(6):1103-9.
44. Annus T, Riiikjäv MA, Rahu K, Björkstén B. Modest increase in seasonal allergic rhinitis and eczema over 8 years among Estonian schoolchildren. *Pediatric allergy and immunology* 2005;16(4):315-20.
45. Borges WG, Burns DAR, Felizola ML, Oliveira BA, Hamu CS, Freitas VC. Prevalence of allergic rhinitis among adolescents from Distrito Federal, Brazil: comparison between ISAAC phases I and III. *Jornal de pediatria* 2006;82(2):137-43.
46. Shamssain MH, Shamsian N. Prevalence and severity of asthma, rhinitis, and atopic eczema in 13-to 14-year-old schoolchildren from the northeast of England. *Annals of Allergy, Asthma & Immunology* 2001;86(4):428-32.

47. Remes S, Korppi M, Kajosaari M, Koivikko A, Soininen L, Pekkanen J. Prevalence of allergic rhinitis and atopic dermatitis among children in four regions of Finland. *Allergy* 1998;53(7):682-89.
48. Asher M, Keil U, Anderson H, Beasley R, Crane J, Martinez F, et al. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. *European respiratory journal* 1995;8(3):483-91.
49. Carvalho N, Fernandez-Benitez M, Cascante L, Aguinaga I, Guillén F. International Study of Asthma and Allergies in Childhood. Results on rhinitis of first phase in Pamplona, Spain. *Allergologia et immunopathologia* 1999;28(4):207-12.
50. Esamai F, Ayaya S, Nyandiko W. Prevalence of asthma, allergic rhinitis and dermatitis in primary school children in Uasin Gishu district, Kenya. *East Afr Med J* 2002;79(10):514-8.
51. Lee Y-L, Su H-J, Sheu H-M, Yu H-S, Guo Y-L. Trafficrelated air pollution, climate, and prevalence of eczema in taiwanese schoolchildren. *J Invest Dermatol* 2008;128(10):2412-20.
52. Ballester F. Contaminación atmosférica, cambio climático y salud. *Rev Esp Salud Pública* 2005; 79(2):159-75.
53. Williams HC, Strachan DP. The natural history of childhood eczema: observations from the British 1958 birth cohort study. *Br J Dermatol* 1998;139:834-9.
54. Yan D-C, Ou L-S, Tsai T-L, Wu W-F, Huang J-L. Prevalence and severity of symptoms of asthma, rhinitis, and eczema in 13-to 14-year-old children in Taipei, Taiwan. *Annals of allergy, asthma & immunology* 2005;95(6):579-85.
55. Viegi G, Annesi I, Matteelli G. Epidemiology of asthma. *European respiratory monograph* 2003;231-25.