

# Allergic Rhinitis and Eczema in a Population of School Children from the City of Gjilan in Kosovo

Kosova Gjilan Şehrindeki Okul Çağı Çocuklarını İçeren Popülasyonda Alerjik Rinit ve Egzamanın İncelenmesi

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## ABSTRACT

**Objective:** The goal of this study was to investigate the gender difference in manifestation of clinical symptoms related to allergic rhinitis and eczema in a population of school children aged 13-14 years from the city of Gjilan in Kosovo.

**Material and method:** About 1200 school children aged between 13-14 years, from randomly selected schools, were included in the study, once the passive consent of their parents/guardians had been received. This study covers the data analysis from the questions related to the nose and skin problems (14 out of 53 questions).

**Results:** Prevalence related to allergic rhinitis; a) sneezing, or a runny or blocked nose ever was 34.20% and in the last 12 months it was 25%; and b) hay fever ever was 14.5%. Prevalence related to eczema; a) itchy rash at any time in the past 12 months was 7.5%; and b) eczema ever in life was 4.2%.

**Conclusion:** This study found a higher prevalence of allergic rhinitis symptoms in female children comparing to male, while no significant connection was found between gender and eczema symptoms.

**Keywords:** School children, allergic rhinitis, eczema, gender, prevalence

## INTRODUCTION

Allergic diseases are serious public health problems throughout the world, and they have an economic impact, both in terms of direct medical costs and indirect costs (school absenteeism and work absenteeism) and also with a negative impact on the quality of life of the affected persons (1).

The prevalence of allergic diseases in the last few decades has risen dramatically (2-6). In 2015, the European Acade-

## ÖZ

**Amaç:** Çalışmada Kosova Gjilan şehrindeki okullarda 13-14 yaşlarındaki çocuklardan oluşan popülasyonda, alerjik rinit ve egzama klinik semptomlarının cinsiyet farklılığı açısından araştırılması amaçlanmıştır.

**Gereç ve Yöntem:** Ebeveynlerin/velilerin pasif onayı alınarak, yaşları 13-14 arasında değişen 1200 çocuk farklı okullardan seçilerek çalışmaya dahil edilmiştir. Çalışma burun ve deri problemleri ile ilişkili soruları kapsayan verilerin analizinden oluşmaktadır (53 sorudan 14'ü).

**Bulgular:** Alerjik rinit ilişkili yaygınlıklar; a) Hapşırma, burun akıntısı veya tıkalı burun gibi durumlar popülasyon genelinde %34,20 olarak saptandı. Bunlardan son 12 aydır bu şikayetlere sahip olanların %25'lik dilimi oluşturduğu görüldü. b) Bahar nezlesi ise %14,5 olarak bulundu. Egzama ilişkili yaygınlıklar; a) Kaşıntılı döküntüler son 12 aylık dönemde incelendiğinde %7,5 olarak görüldü. b) Yaşamı boyunca az bir kere egzama görülenlerin %4,2'lik dilimi oluşturduğu belirlendi.

**Sonuç:** Alerjik rinitle ilişkili belirtiler kız çocuklarında erkeklere oranla daha yüksek bir yakınlıkla ilişkili bulunurken, egzama belirtileri ve cinsiyet arasında istatistiksel olarak anlamlı bir ilişki bulunamadı.

**Anahtar Kelimeler:** Okul çocukları, alerjik rinit, egzama, cinsiyet, yaygınlık

my of Allergy and Clinical Immunology (EAACI) reported that more than 150 million Europeans suffer from allergic diseases and the prediction is that by 2025 half of the entire European Union (EU) population will be affected.

Allergic rhinitis is among the most frequent disorders during childhood. Although it is not considered to be a serious disease, it has a significant impact on the quality of life of the patient. Allergic rhinitis is a chronic disease characterized by inflammation and swelling of the inner parts of the nose after inhalation of allergens. Symptomatology

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of allergic rhinitis is quite specific, with sneezing, runny nose, itching, and nasal congestion. Also, it is often associated with ocular symptoms such as itching, redness or tearful eyes, allergic rhinoconjunctivitis. Allergic rhinitis is a recognized risk factor for the development of asthma, with about 40% of patients with allergic rhinitis reporting for asthma symptoms while 80% of asthmatic patients have symptomatic allergic rhinitis (7-10). In addition, allergic rhinitis is also risk factor for asthma control, and uncontrolled rhinitis exacerbates co-existing asthma (11, 12). According to the World Health Organization, 400 million people in the world suffer from allergic rhinitis and 300 million from asthma (13).

Atopic dermatitis (eczema) affects up to 20% of children and often precedes allergic rhinitis and asthma, a relationship known as "atopic march" (14-16). It is an inflammatory skin disorder, mostly localized on the flexural parts, characterized by itching of these regions that may result in skin damage and secondary infection. In addition, it can result in sleep loss and a serious reduction on the quality of life not only for the affected persons, but also their families (17-19).

Allergies are progressive diseases and neglecting their symptoms may lead to their deterioration (20, 21). Therefore, in the management of allergies it is important to raise the population's awareness of the disease, to identify the risk factors and to take appropriate strategic measures. Genetic predispositions, environmental factors, and social behavior interact in allergic disease manifestation (7-9).

Certain clinical and epidemiological studies have shown gender differences in the prevalence of allergies (22, 23). According to these, the ratio between age and the incidence of allergies is higher in boys before puberty and in girls after puberty. Research related to gender differences in atopic diseases gives the opportunity to investigate the factors responsible for the occurrence and course of these diseases and would improve the ability to effectively manage allergies in clinical practice.

The aim of this study was to investigate the gender difference in manifestation of clinical symptoms related to allergic rhinitis and eczema in a population of school children aged 13-14 years from the city of Gjilan in Kosovo.

## MATERIAL AND METHOD

The analytical cross-sectional study was carried out in the city of Gjilan, a municipality located in southeast Kosovo, during the year 2018, as a part of the Project of Global Asthma Network (GAN) Phase I.

### Sample of the Study

In the study 1200 school children were included, from both genders, aged between 13-14 years. They were from randomly selected schools in the city of Gjilan, and the passive consent of their parents/guardians was received before the research started.

### Study Instrument

In accordance with GAN, standardized self-administrated questionnaires of ISSAC (International Study of Asthma and Allergies in Childhood) Phase III were used, after being translated into the Albanian language and validated, with no additional questions added. The pilot study for evaluation of the translated questionnaire was applied on 50 randomly selected children. All received remarks were incorporated into the final version of the questionnaire. This study covers the data analysis from the questions related to the nose and skin problems (14 out of 53 questions).

In accordance with the study protocol, assessment of the prevalence of rhinitis and eczema was made based on the average prevalence of positive answers on the core questions. Prevalence of allergic rhinitis symptoms was determined through questions "In the past 12 months, have you had a problem with sneezing, or a runny or blocked nose when you did not have a cold or the flu?"; "In the past 12 months, has this nose problem been accompanied by itchy-watery eyes?" and "Have you ever had hay fever?". Prevalence of eczema symptoms was determined from questions "Have you ever had a an itchy rash which was coming and going for at least six months?", "Have you had this itchy rash at any time in the past 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?" and "Have you ever had eczema?".

### Implementation of the Study

Initially, we measured the weight and height of the children. During the measurements the children were wearing light clothing and were bare footed. Then the questionnaires were given to the children to be filled out, under the supervision of trained representatives from the project team. About 60-90 minutes were given for completing the questionnaire. Children were told to feel free to ask questions related to possible dilemmas.

The Ethics Committee of the Ministry of Health and the Ministry of Education and Science, Kosovo, approved the implementation of the GAN Phase One in Kosovo.

### Statistical Analysis

Data was statistically analyzed in Statistical Package for Social Sciences software package, version 22.0 for Windows (IBM Corp.; Armonk, NY, USA). According to The International Study of Asthma and Allergies in Childhood (ISAAC) recommendation, missing or "any other" responses were part of the denominator for the calculation of allergic rhinitis and eczema prevalence figures (ISAAC Phase III Newsletter. Auckland, New Zealand, December 2001). The qualitative series were processed by determining the coefficient of relations, proportions, and rates, and were shown as absolute and relative numbers. Quantitative series were analyzed with measures of central tendency (average, median), as well as with dispersion measures (standard deviation, standard error). Pearson Chi-square test,

Yates corrected, Fischer exact test, and Fisher Freeman Halton exact test were used to determine the association between certain attributive dichotomies. A two-sided analysis with a significance level of  $p < 0.05$  was used to determine the statistical significance.

## RESULTS

The sample of 1200 school children aged 13-14 was shown in the study. About 618 (51.5%) were male and 582 (48.5%) were female with relation between the genders of 1:1.1. The percentage difference between the genders in the sample, for  $p > 0.05$ , was not statistically significant (Difference test: Difference 3% [(-0.99-6.99) CI 95%]; Chi-square=2.159; df=1  $p=0.1417$ ). Mean age was  $13.4 \pm 0.51$  with median IQR=13 (13, 14).

### Prevalence of rhinitis according to gender

Related to nose problems a total of 7 questions were analyzed. The problem with sneezing or a runny or blocked nose when no cold or flu detected was found:

a) In the category 'ever in life', occurrence was, significantly, 1543 times more frequent in females [OR=1.543 (1.21-1.96) 95% CI]; b) In the category 'last 12 months' occurrence was, significantly, 1467 times more frequent in females [OR=1.467 (1.13-1.91) 95% CI]. A nose problem accompanied by an itchy nose in the last 12 months was 1554 times significantly more frequent in females [OR=1.554 (1.09-2.22) 95% CI]. A nose problem accompanied by itchy-watery eyes in the last 12 months was 1494 times significantly more frequent in females [OR=1.494 (1.04-1.14) 95% CI]. Also, the life experience of hay fever was found 1.525 times significantly more often in female than in male school children [OR=1.525 (1.10-2.11) 95% CI]. Incidents of hay fever confirmed by a doctor occurred in 76 (6.3%) of the school children. No significant association ( $p > 0.05$ ) was found between gender and the answers to all other questions related to nose problems (Table 1). Prevalence related to: a) sneezing, or a runny or blocked nose ever was 34.20% and in the last 12 months it was 25%; b) a nose problem accompanied by itchy-watery eyes in the last 12 months was 11.3% and accompanied by itchy nose was 11.7% and c) hay fever ever was 14.5%.

### Prevalence of Eczema According to Gender

Analysis of skin problems covered 7 questions. No significant association ( $p > 0.05$ ) was found between gender and the answers to all questions related to skin problems presented in Table 2. Prevalence of positive answers related to: a) itchy rash ever which was last for 6 months was 11.8% and at any time in the past 12 month sit was 7.5%; b) itchy rash at any time affected any of the following places: the folds of the elbows, behind the knees, in front of the ankle, under the buttocks or around the neck, ears or eyes was 4.3%; c) itchy rash cleared completely at any time during last 12 months was 5.8% and d) eczema ever in life was 4.2%. Eczema confirmed by a doctor occurred in 20 (1.7%) of the school children.

## DISCUSSION

This is the first study on this topic conducted in Kosovo, therefore the obtained data can be used as a baseline for assessment of future analysis of prevalence and other epidemiological characteristics of these diseases. Prevalence of allergic rhinitis symptoms in the last 12 months in our study was 25%, whereas prevalence of rhinoconjunctivitis symptoms in the last 12 months was 11.3%. In relation to gender there is a higher prevalence of symptomatology of rhinitis in female children compared with male. Prevalence of eczema symptoms in the last 12 months was 7.5% with no significant association between genders.

Whereas in the past it was thought that the prevalence of allergic diseases was higher in developed countries, from the first global reporting by ISAAC, it is apparent that the prevalence of these diseases was similar or even higher in low-income countries than developed countries, with higher degree of variability at regional and country level (24).

Average global prevalence of current symptoms of rhinoconjunctivitis in children registered during ISAAC Phase III was 14.6%, with the highest rates observed in Africa (18.0%) and Latin America (17.3%) and the lowest in Northern and Eastern Europe (9.2%) (25). Prevalence of current symptoms of eczema was 7.3%, with ranging values from 0.9% in China to 24.6% in Columbia, with the highest values in Africa and Latin America (26). In Europe, the lowest prevalence of symptoms of eczema was found in Northern and Eastern Europe, with intermediate values in Western Europe (24).

In neighboring countries a relatively low prevalence of respiratory allergic disorders has been registered, with average values of prevalence of rhinoconjunctivitis symptoms of 5.5% in Albania and the Republic of Macedonia, 7.6% in Serbia and Montenegro, 8.4% in Bulgaria (25), whereas the prevalence of eczema symptoms was 2.0% in Albania, 2.7% in the Republic of Macedonia, 5.6% in Serbia and Montenegro, 3.0% in Bulgaria (26). There were more girls than boys with symptoms of both conditions, and this held true for most regions.

A female higher prevalence of allergies from puberty and thereafter, including hay fever and eczema is reported by Osman et al. (27), also Fröhlich et al. (28) showed sex-related differences in rhinitis prevalence as well for asthma in a global systematic review with meta-analysis with a prevalence shift from male to female at around puberty. Austin et al. (29) showed gender differences in occurrence of allergic rhinitis symptomatology and eczema with predominate of female children, suggesting that this reverse ratio may be present as early as 12-14 years of age. More frequent occurrences of rhinitis and eczema in girls than in boys also was reported by Arrais et al. (30), in a study of 13-14 years old children.

The main possible mechanisms responsible for the high prevalence of allergies to female gender compared with male gender during and after puberty are suggested to be because female sex hormones increase atopic predispositions, whereas male

hormones have a protective effect (31). In the homeostasis of immunity, the function of sexual hormones is very important (32). Estrogens and progesterone stimulate Th2 response and suppress Th1 response in females, whereas testosterone suppresses Th2 response in males (33). The effect of estrogens on the activation of mastocytes and the development of allergic

sensitization has been demonstrated in experiments on rodents, as well as the action of progesterone in the suppression of release of histamine on one side and the strengthening of IgE induction on the other side (32). Testosterone inhibits group 2 innate lymphoid cells (ILC2s), which are potent promoters of Th-2 responses (34).

**Table 1.** Analysis of questions related to nose problems that occur when there is no cold or flu according to gender

Questions	Gender			p	
	male	female	total		
Have you ever had a problem with sneezing or a runny or blocked nose when you DID NOT have cold or flu (n=1200)					
Yes	n	182	228	410	Pearson Chi-square: 12.604; df=1; p=0.0004*
	%	29.45	39.18	34.20	
In the past 12 months, have you had a problem with sneezing or a runny or blocked nose when you DID NOT have a cold or the flu? (n=1200)					
Yes	n	133	167	300	Pearson Chi-square: 8.225; df=1; p=0.0041*
	%	21.52	28.69	25	
In the past 12 months, has this nose problem been accompanied by an itchy nose? (n=1200)					
Yes	n	59	82	141	Pearson Chi-square: 5.964; df=1; p=0.0146*
	%	9.55	14.09	11.75	
In the past 12 months, has this nose problem been accompanied by itchy-watery eyes? (n=1200)					
Yes	n	58	78	136	Pearson Chi-square: 4.813; df=1; p=0.0282*
	%	9.39	13.40	11.33	
In the past 12 months, how much did this nose problem interfere with your daily activities? (n=1200)					
Not at all	n	537	478	1015	Fisher Freeman Halton exact test: p=0.0630
	%	86.89	82.13	84.58	
A little	n	67	80	147	
	%	10.84	13.75	12.25	
A moderate amount	n	13	19	32	
	%	2.10	3.26	2.67	
A lot	n	1	5	6	
	%	0.16	0.86	0.50	
Have you ever had hay fever? (n=1200)					
Yes	n	74	100	174	Pearson Chi-square: 6.4991; df=1; p=0.0104*
	%	11.97	17.18	14.50	
Was your hay fever confirmed by a doctor? (n=1200)					
Yes	n	32	44	76	Pearson Chi-square: 2.867; df=1; p=0.0904
	%	5.18	7.56	6.33	

\*significant for p<0.05

Our results are consistent with previous research demonstrating the impact of gender in the prevalence of allergies, except for eczema symptoms where no significant differences have been found between genders. Here we must consider the impact of various environmental factors, apart from gender and also several limitations of the study. Some children can poorly perceive their allergic symptoms, others can exaggerate them, and there may be those who even try to dismiss the disease. Also, a part of this symptomatology may not be of allergic origin and, in addition,

itchy skin conditions such as scabies or helminth infestations, should be considered as common problems in developing countries that also can contribute to higher eczema estimates.

## CONCLUSION

This study found a higher prevalence of allergic rhinitis symptoms in female children when compared with male children. No significant association was found between gender and

**Table 2.** Analysis of questions related to skin problems according to gender

Questions	Gender			p	
	Male	female	total		
Have you ever had an itchy rash which was coming and going for at least six months? (n=1200)					
Yes	n	67	75	142	Pearson Chi-square: 1.201; df=1; p=0.2729
	%	10.84	12.89	11.85	
Have you had this itchy rash at any time in the past 12 months? (n=1200)					
Yes	n	42	48	90	Pearson Chi-square: 0.910; df=1; p=0.3401
	%	6.80	8.25	7.50	
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 ankle, under the buttocks or around the neck, ears or eyes? (n=1200)					
Yes	n	20	32	52	Pearson Chi-square: 3.699; df=1; p=0.0544
	%	3.24	5.50	4.33	
Has this itchy rash cleared completely at any time during the past 12 months? (n=1200)					
Yes	n	32	38	70	Pearson Chi-square: 0.996; df=1; p=0.3182
	%	5.18	6.53	5.83	
In the past 12 months, how often on average, have you been kept awake at night by this itchy rash? (n=1200)					
Never	n	602	564	1166	Pearson Chi-square: 0.293; df=2; p=0.8637
	%	97.41	96.91	97.17	
Less than one night per week	n	11	12	23	
	%	1.78	2.06	1.92	
One or more nights per week	n	5	6	11	
	%	0.81	1.03	0.92	
Have you ever had eczema? (n=1200)					
Yes	n	19	31	50	Pearson Chi-square: 3.8069; df=1; p=0.0514
	%	3.07	5.33	4.17	
Was your eczema confirmed by a doctor? (n=1200)					
Yes	n	8	12	20	Pearson Chi-square: 1.077; df=1; p=0.2993
	%	1.29	2.06	1.67	

\*significant for p<0.05

symptoms of eczema. Taking into account that this is the first study of this type in Kosovo, further more extensive research is needed to examine this problem.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the Ethics Committee of the Ministry of Health and the Ministry of Education and Science, Kosovo.

**Informed Consent:** Passive informed consent was obtained from the parents' of the patients who participated in this study.

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