ASSOCIATION OF FAMILIAL AND ENVIRONMENTAL FACTORS WITH ASTHMA AND ALLERGIC DISEASES IN UKRAINIAN CHILDREN POPULATION

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Background. Asthma and other allergic diseases as influenced by environmental and familial factors might be targeted using preventive measures. These diseases are a matter of some urgency in Ukraine because of the clinical, social and economic importance in childhood.

Objective. The aim of this study was to investigate the relationship between prevalence of asthma, spastic bronchitis, allergic rhinitis, atopic eczema, unspecified hypersensitization and some selected environmental and familial factors in a population sample of 6 to14-yrs old Western Ukraine schoolchildren.

Methods. The data set of the study was collected using a questionnaire-based survey, containing the data of 4871 urban and rural children age 6 to 14 years. Correlation of asthma and allergic disease with familial and environmental factors was examined by means of multivariate logistic regression.

Results. Increased risk of asthma (1.7 %) was associated with the urban residence (OR=1.8; p=0.04) and high parental education (OR=1.8; p=0.02); spastic bronchitis (6.2%) – with parental allergy (OR=1.3; p=0.03); atopic eczema (6.2 %) – with younger age (OR=1.3; p=0.03), high parental education (OR=1.3; p=0.03), parental allergy (OR=1.4; p=0.02), tobacco smoke at home (OR=0.7; p=0.01) and household density (OR=0.6; p=0.001); diagnosis of unspecified allergic sensitization (11.8 %) was related to high parental education (OR=1.2; p=0.03), parental employment (OR=0.8; p=0.02) and pets at home (OR=1.2; p=0.06).

Conclusions. This study identifies that lifeslyle and building factors are associated with an altered prevalence of common childhood allergic diseases. Prevention may need to address the minimization of potential risk-factors.

KEY WORDS: asthma, environmental factors, children.

Introduction

Prevalence of asthma and allergies among children has become an increasing problem during the last few decades. Asthma has become the most common chronic disease among children and is one of the major causes of hospitalization among those younger than 15 years of age. As more people become sensitized to allergens, allergic diseases may increase in Europe in the coming years [1]. Previous ISAAC studies revealed a relatively low prevalence of allergic diseases specifically in Eastern Europe. While the results of the studies from different areas in Eastern Europe have been reported, less is known about the current epidemiology of childhood allergic diseases in different areas of Ukraine [2, 3]. With the prevalence of childhood asthma and allergic diseases increasing worldwide over the past decades, it is widely accepted that environmental factors, in addition to genetics, are closely related to allergic diseases [4, 5]. The role of environmental factors in relation to asthma and allergy increased

through the 1990s. There has been widespread public concern that changing patterns of outdoor air pollution underlie the rising burden of asthma, but the professionals are not so sure about such correlations. The indoor environment, in which people spend most of their time, has received less attention [6, 7].

The aims of this study was firstly, to quantify the prevalence of asthma, spastic bronchitis, allergic rhinitis, atopic eczema, unspecified hypersensitization in schoolchildren in Ternopil and Ternopil region, and secondly, to evaluate associations between children's asthma and allergic diseases from one side and housing and familial characteristics from another.

Methods

We used questionnaire which was based on the ISAAC symptom questionnaire in Ukrainian language. The questionnaires were answered by parents or guardians of children, aged 6 to 14 years old from Ternopil and surrounding rural area. Issues and factors affecting the prevalence of physician-diagnosed asthma, spastic bronchitis, allergic rhinitis, atopic eczema, and unspecified hypersensitization

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were included in the list of allergic diseases. The study protocol was approved by the local ethics committee at the Ternopil State Medical University (№ 1 (b) from 07.04.2010). Independent variables of interest were based on questionnaire self-report. Subgroups of subjects defined by place of residence (urban/rural), gender (male/female), age group (<10 years old / >10 years old), parental education (less than high school/high school or above), parental employment (both unemployed/otherwise), any diagnosed parental allergy (at least one parent: yes/no), tobacco exposure at home – smoking adult at home (yes/no), housing (multi-storey house/otherwise), heating of the house (coal or wood stove/otherwise), household density – defined as the ratio of persons living in the house to rooms in the house (≥1 person per room/otherwise), dampness in house defined as moisture stains or signs of mold on the inner surfaces in the house (yes/no), contact with pets inside the house (yes/no).

Statistical analysis was performed by using Statistica 7.1 software. Descriptive analyses were used to examine the prevalence of each outcome with the personal and environmental characteristics of the study population. Statistical significance was assessed using chi^2 test. Multivariable logistic regression analyses with each outcome were used to examine the association with the personal and environmental characteristics and to account for potential confounding. For these analyses, outcomes were the diseases or symptoms of interest. The strength of association was based on the Odds ratio (OR) and 95 % confidence intervals (CI).

Results

Analysis of 4871 completed questionnaires has found the following results: study population was 50.8 % females and 49.2 % males. 54.7 % of children lived in an urban area, 47.3 % – in rural. Groups of

children living in urban and rural areas were similar (p<0.05) in terms of age (10.4±2.0 years and 10.5±2.0 years, respectively) and gender (51.0 % and 50.5 %, respectively, were females). Descriptive characteristics of the study population by urban and rural status are presented in Table 1.

The prevalence of respiratory and allergic diseases were: childhood asthma – 1.70 %, spastic bronchitis – 6.26 %, allergic rhinitis – 5.79 %, atopic dermatitis – 12.40 %, and current chest wheezing – 11.56 %. Table 2 shows the prevalence of respiratory and allergic outcomes by characteristics of the study group.

Bronchial asthma prevailed in children from urban areas or those with a higher parental education. A higher prevalence of spastic bronchitis was found among those with a parental history of allergy. A higher prevalence of allergic rhinitis was also found among those in an urban area compared to a rural area. There were no statistically significant differences between categories of the characteristics considered for atopic eczema.

As results from logistic regression analysis, we found that an increased risk of asthma was associated with urban residence (p=0.04) and high parental education (p=0.02). Spastic bronchitis was associated with parental allergy (p=0.03). Atopic eczema had statistically significant associations with younger age (p=0.03), high parental education (p=0.03), parental allergy (p=0.02), tobacco smoke at home (p=0.02) and household crowding (p=0.0007). Diagnosis of unspecified sensitization was related to high parental education (p=0.03) and parental employment (p=0.02) (Table 3).

Discussion

This study was designed to assess the relationship between physician-diagnosed asthma, spastic bronchitis, allergic rhinitis, atopic eczema,

Table 1. Descriptive characteristics of the study population in the Ternopil region.

Characteristic	Total N=4871 (%)	Rural N=2206 (%)	Urban N=2665 (%)	p
Age below 11 years	48.0	49.9	46.4	0.01
Male gender	49.2	48.9	49.5	0.7
Higher parental education (both parents)	55.9	49.5	61.2	0.0001
Parental unemployment (both parents)	23.8	27.6	20.7	0.0001
Any allergic disease in mother or father	18.1	13.8	21.7	0.0001
Tobacco exposure at home – smoking adult a home	47.3	48.4	46.4	0.1
Residence in a multi-storey house	56.8	25.6	82.7	0.0001
Coal stove (heating/cooking)	3.3	6.3	0.9	0.0001
Household density >1 person per room	78.4	78.6	78.2	0.7
Dampness in house	35.0	37.9	32.7	0.0001
Contact with pets inside the house	56.5	68.4	46.2	0.0001

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Characteristic		Asthma N (%)	Spastic bronchitis N (%)	Allergic rhinitis N (%)	Atopic Eczema N (%)	Allergy (not specifed) N (%)
Residence	Urban	55 (2.06)	156 (5.85)	86 (3.23)	136 (6.17)	300 (11.26)
	Rural	28 (1.27)	149 (6.75)	83 (3.76)	170 (6.38)	274 (12.42)
	P value*	0.03	0.1	0.3	0.7	0.2
Gender	Male	37 (1.54)	151 (6.29)	83 (3.46)	160 (6.67)	293 (12.21)
	Female	46 (1.86)	154 (6.23)	86 (3.48)	146 (5.91)	281 (11.37)
	P value*	0.3	0.9	0.9	0.2	0.3
Parental education	High	57 (2.09)	180 (6.61)	108 (3.97)	193 (7.09)	351 (12.89)
	< High	26 (1.21)	125 (5.82)	61 (2.84)	113 (5.26)	223 (10.38)
	P value*	0.01	0.2	0.03	0.008	0.06
Parental Employment	Yes	62 (1.67)	237 (6.39)	139 (3.75)	236 (6.36)	464 (12.51)
	No	21 (1.81)	68 (5.85)	30 (2.58)	70 (6.02)	110 (9.47)
	P value*	0.7	0.5	0.05	0.6	0.005
Parental allergy – any diagnosed	Yes	19 (2.15)	69 (7.82)	34 (3.85)	72 (8.16)	110 (12.47)
	No	64 (1.60)	236 (5.92)	135 (3.38)	234 (5.87)	464 (11.63)
	P value*	0.2	0.03	0.4	0.01	0.4
Tobacco exposure at	Yes	36 (1.56)	141 (6.11)	78 (3.38)	123 (5.33)	275 (11.93)
	No	47 (1.83)	164 (6.39)	91 (3.55)	183 (7.13)	299 (11.66)
	P value*	0.4	0.6	0.7	0.009	0.7
Housing	Multi-storey house	49 (1.77)	162 (5.85)	91 (3.29)	178 (6.43)	311 (11.24)
	Other	34 (1.62)	143 (6.80)	78 (3.71)	128 (6.08)	263 (12.50)
	P value*	0.6	0.1	0.4	0.6	0.1
Heating of house	Coal/wood	2 (1.23)	9 (5.52)	3 (1.84)	11 (6.75)	15 (9.20)
	Central	81 (1.72)	296 (6.29)	166 (3.53)	295 (6.27)	559 (11.87)
	P value*	0.6	0.6	0.2	0.8	0.2
Household density	1+person /room	67 (1.75)	229 (6.00)	138 (3.61)	213 (5.58)	450 (11.79)
	<1person /room	16 (1.52)	76 (7.22)	31 (2.94)	93 (8.83)	124 (11.78)
	P value*	0.6	0.1	0.2	0.0001	0.9
Dampness in house	Yes	26 (1.52)	105 (6.14)	59 (3.45)	99 (5.79)	199 (11.64)
	No	57 (1.80)	200 (6.33)	110 (3.48)	207 (6.55)	375 (11.86)
	P value*	0.4	0.8	0.9	0.3	0.8
Contact with pets inside the house	Yes	41 (1.49)	175 (6.35)	104 (3.77)	165 (5.99)	345 (12.52)
	No	42 (1.98)	130 (6.14)	65 (3.07)	141 (6.66)	229 (10.82)
	P value*	0.1	0.7	0.1	0.3	0.06

unspecified hypersensitization and various family risk and environmental factors while using representative sample of schoolchildren in the 6 to 14 yrs-old age group from a defined geographical area. It was found that 1.7 % had physician diagnosed asthma, 6.26 % – spastic bronchitis, 5.79 % – allergic rhinitis and 12.40 % – atopic dermatitis. The prevalence of childhood asthma in the Ternopil Region was relatively low comparing to other studies from Eastern Europe and much lower than in the recent findings in children of Kiev (8.1 % in 6–7 years old children and 6.1 % in the 13–14 year old children) [Akopian A. Z. – unpublished report].

There is an evidence to support an underdiagnosis of asthma in this study population. Low prevalence of childhood asthma in the Ternopil Region and frequent occurrence of allergic diseases at the same time, within the range of the published data, suggests an asthma underdiagnosis. Our study revealed a relatively frequent occurrence of spastic bronchitis (6.2 %), which is suggestive of an asthma-like response. However, it is lower then the previous report for central and eastern European children [8].

Using multivariable logistic regression analysis, it was established that urban residence was positively associated with asthma, while parental allergy - with spastic bronchitis in children. High parental education was related to asthma, atopic eczema and unspecified sensitization of children. Parental allergy, tobacco smoke at home, household crowding were positively associated with children's atopic eczema. Keeping pets at home was related with unspecified sensitization of children.

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Table 3. Associations of allergic diseases with environmental and familiar factors (multivariate logistic regressions)

Indicator	Odds ratio (95% CI)				
	Asthma	Spastic Bronchitis	Allergic Rhinitis	Atopic Eczema	Allergy (not specified)
Age ≤10	1.14	1.11	1.31	1.29	1.04
	(0.73-1.76)	(0.86-1.42)	(0.96-1.79)	(1.02-1.64)	(0.87-1.24)
	p=0.5	p=0.007	p=0.09	p=0.03	p=0.6
Urban Residence	1.79	0.89	0.86	0.95	0.92
	(1.02-3.14)	(0.67-1.19)	(0.59-1.26)	(0.71-1.27)	(0.74-1.14)
	p=0.04	p=0.4	p=0.4	p=0.7	p=0.4
Gender – Male	0.82	1.00	1.04	1.10	1.11
	(0.53-1.27)	(0.79-1.27)	(0.75-1.39)	(0.87-1.39)	(0.93-1.32)
	p=0.3	p=0.9	p=0.8	p=0.4	p=0.2
High Parental education	1.78	1.11	1.33	1.31	1.22
	(1.08-2.92)	(0.86-1.42)	(0.95-1.86)	(1.02-1.67)	(1.01-1.48)
	p=0.02	p=0.4	p=0.09	p=0.03	p=0.03
Parental Employment	1.38	0.92	0.75	1.00	0.77
	(0.81-2.33)	(0.69-1.24)	(0.49-1.14)	(0.75-1.34)	(0.62-0.97)
	p=0.2	p=0.5	p=0.1	p=0.9	p=0.02
Parental allergy – any diagnosed	1.21	1.35	1.10	1.37	1.06
	(0.71-2.06)	(1.01-1.80)	(0.74-1.62)	(1.03-1.82)	(0.84-1.33)
	p=0.4	p=0.03	p=0.6	p=0.02	p=0.6
Tobacco exposure at home	0.90	0.97	0.95	0.75	1.03
	(0.58-1.40)	(0.76-1.22)	(0.70-1.30)	(0.59-0.95)	(0.87-1.23)
	p=0.6	p=0.7	p=0.7	p=0.01	p=0.7
Housing–multi-storey house	0.70	0.88	0.92	1.07	0.91
	(0.41-1.20)	(0.66-1.17)	(0.63-1.36)	(0.80-1.43)	(0.73-1.13)
	p=0.1	p=0.3	p=0.6	p=0.6	p=0.3
Heating of house – coal or woods stove	0.91	0.82	0.48	1.20	0.71
	(0.22-3.45)	(0.41-1.64)	(0.15-1.52)	(0.63-2.28)	(0.41-1.23)
	p=0.9	p=0.5	p=0.2	p=0.5	p=0.2
Household density ≥1+person/room	1.26	0.86	1.25	0.64	0.99
	(0.72-2.21)	(0.65-1.13)	(0.84-1.86)	(0.49-0.83)	(0.80-1.23)
	p=0.4	p=0.2	p=0.2	p=0.0007	p=0.9
Dampness in house	0.85	0.93	0.93	0.89	0.94
	(0.53-1.37)	(0.72-1.19)	(0.67-1.30)	(0.67-1.14)	(0.78-1.14)
	p=0.4	p=0.5	p=0.6	p=0.5	p=0.5
Pet in house	0.81	1.04	1.24	0.99	1.17
	(0.51-1.27)	(0.81-1.33)	(0.90-1.72)	(0.77-1.27)	(0.97-1.41)
	p=0.3	p=0.7	p=0.2	p=0.9	p=0.06

Conclusions

This cross-sectional examination suggests that environmental and family risk factors are associated with prevalence of asthma, spastic bronchitis, atopic eczema and unspecified sensitization in 6 to 14-yrs-old schoolchildren in Ternopil. The determination of potentially preventable environmental and family factors affecting risk of allergic disease is important, considering the apparent world-wide increases in the prevalence of childhood allergic disease. This study identifies lifestyle, building factors which are associated with an altered prevalence of common childhood allergic disease. Prevention may need to address the minimization of potential risk-factors.

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