Human ecology studies: the role of environmental factors in pregnancy

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The relation between ecological factors and allergy during pregnancy was analysed and their influence on pregnant women's health status was evaluated. The total of 205 pregnant women were interviewed using a questionnaire which included 235 questions concerning health status, housing conditions, socioeconomic status, environmental factors, smoking habits, family history of atopy, allergies and other. There were 121 (59.02%) healthy, 58 (28.29%) allergic and 26 (12.68%) atopic women among the respondents (the total of 84 (40.88%) in the allergy/atopy group). The differences between the healthy women and the allergic or atopic ones were significant in some cases. There was no significant difference between smoking women in healthy and allergic/atopic groups (p = 0.1209/0.8927). However, there were considerable differences in the family history of allergy (p < 0.0001), allergy history, pollinosis in the family, presence of soft furniture at home, dry flat.

Key words: atopy, allergy, pregnancy, sensitization, prenatal ecological factors

INTRODUCTION

The situation of human ecology depends not only on the changing natural environment, but also on the socio-economical conditions of the country. In recent years, there has been a growing interest in the relationships between the risk of atopic allergic diseases and data on perinatal status (Bjerke et al., 1995, Lopez et al., 1999, Platts-Mills et al., 2003) depending on the changing environment. The human body is most sensible to these changes during the period of pregnancy. The prevalence of allergic diseases has been growing up in the developing countries, especially in the past few decades (Bjerke et al., 1995, Jarvis et al., 1995). Several authors have reported that environmental factors such as tobacco smoking, type of building, indoor and outdoor allergens, diet, occupa-

tional exposures, living conditions, hereditary factors and air pollution have a great influence on a pregnant woman and are closely associated with the development of atopic diseases. (Lin et al., 2004, Ownby et al., 1991). The role of ecological factors in the development of allergy has been studied since 1980 in Lithuania. There were some studies in selected groups of population (healthy students, allergic children and adults) in which ecological factors important for allergy were determined (Dubakiene et al., 2004). The house dust mite *Dermatophagoides pteronyssinus* allergen was reported to be the main environmental allergen in Lithuania (Dubakiene et al., 2004). A study of allergic problems in pregnant women has been performed in Lithuania for the first time.

The aim of the present study was to determine the ecological factors of allergy during the prenatal period (pregnancy) and to evaluate their influence on the health status of pregnant women in Lithuania.

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MATERIALS AND METHODS

Subjects and population. The pregnant respondents were selected at the Department of Obstetrics, Kaunas 2nd Clinical Hospital, between September 1, 2004 and January 1, 2005. A total of 205 pregnant women were included into the study. The questionnaires were collected one month before each infant's predicted birth. Each neonate's umbilical cord blood was collected immediately after birth. All the protocols were approved by the Institutional Review Board of Kaunas 2nd Clinical Hospital.

Questionnaire. The pregnant women were asked about their age, the number of live births, education level, self-reported environmental pollutants, history of atopic diseases (atopic dermatitis, allergic rhinitis and asthma) in their maternal and paternal families, and pets at home. Questions about dampness of the house, carpets at home, tobacco smoking before and during pregnancy were also included into the questionnaire.

Health data at birth were also collected from the neonate records of the hospital (head circumference, weight, height, and weeks of gestation). None of the women had any complications during pregnancy.

Statistical analysis

The data were processed by a statistical analysis of determinants of mean and standard error of numerical variables. Multi-variate logistic regression analysis was done to detect an association between dependent and independent variables. The variables were included in the multi-variate logistic regression analysis according to the data-missing percentage from low to high. The Pearson χ^2-test was used to determine the difference of frequency between two or more groups. P values were determined by a two-tailed test, and statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Two hundred and five pregnant women were included into the present study. According to their responses, they were classified into three groups: 121 of them were practically healthy, 26 showed symptoms of atopy, 58 had one or more allergic symptoms. The age of the groups was comparable. The demographic data on the study subjects are presented in Table 1.

There were no significant differences among the study groups regarding age, living place and education. Table 2 presents data about the housing conditions of the respondents .

According to our data, there were no essential differences among the study groups, except that many pregnant women lived in wet and wooden houses.

Data on the influence of smoking during pregnancy are presented in Table 3.

Multi-variate logistic regression analysis was used to study the dependent and independent variables (environmental factors). After adjustment for maternal age, maternal exposure to smoking and smoking habits, if the P values before pregnancy, smoking while pregnant, self-reported dampness in the house, self-reported environmental pollution and paternal education levels, pets at home and parental professions were >0.2, we excluded them from the multi-variate analysis. Maternal age, maternal education levels, paternal grandparents' atopy were significant factors for atopic and allergic but not for healthy pregnant women. The data are presented in Table 4.

The results of our study demonstrated that the environmental factors had a great influence on human ecology, especially on pregnant women. The adjusted factors for the analysis were maternal age, smoking before pregnancy, maternal educational levels, home environment

Table 1. Demographic characteristics of the pregnant women studied

Factor		Healthy n (%)	Allergic n (%)	χ^2	p
Age	<20	11 (9.4)	4 (4.76)		
	20–29	80 (68.38)	58 (69.05)		
	30–39	26 (22.22)	21 (25.00)	2.97	0.39
	>40	0 (0.00)	1 (1.19)		
Place of residence	City	91 (77.78)	68 (80.95)	0.29	0.59
	Village	26 (22.22)	16 (19.05)		
Education	Basic	54 (48.21)	31 (38.27)	1.98	0.58
			26 (32.10)		
	Higher	29 (25.89)	6 (7.41)		
	Unfinished higher	8 (7.14)	18 (22.22)		
	University	21 (18.75)			

Table 2. **Housing conditions of the study cohort**

Parameters	Pregnant women					
	Healthy		Atopic		Allergic	
	n	%	n	%	n	%
House building material						
1. block	42	34.71	13	50.00	17	29.3
2. stone	65	53.72	10	38.46	33	56.9
3. wooden	16	13.22	3	11.54	8	13.7
Heating type						
1. stove	24	19.83	5	19, 23	10	17.24
2. gas	11	09.09	0	0, 00	4	6.90
3. central	66	54.55	18	69, 23	34	58.62
4. electrical	1	0.83	1	3.85	1	1.72
5. central + stove	19	15.70	2	7.69	9	15.52
Characteristics of house						
1. wet	1	0.5	39	19	165	80.5
2. dry	1	0.5	41	20	163	79.5
Location of the house						
1. by lake, river	28	23.14	6	23.08	17	29.31
2. near the forest	38	31.40	8	30.77	15	25.86
Soft furniture present in the house	104	85.95	21	80.77	56	96.55

Table 3. **Smoking in pregnant women's environment**

Factor		Healthy n (%)	Allergic n (%)	χ^2	p
Women's smoking	Smoking before pregnancy	45 (38.46)	31 (36.90)	0.9	0.64
	Smoking during pregnancy Smoking Non-smoker	14 (11.97) 58 (49.57)	7 (8.33) 46 (54.76)		
Husbands' smoking	Non-smoker	32 (27.35)	21 (25.00)		
	Stopped smoking Smoking	14 (11.97) 71 (60.68)	16 (19.05) 47 (55.95)	1.93	0.38
Active + passive smoking	One of the parents has smoked or is smoking Neither father no mother have ever smoked	91 (77.80) 26 (22.22)	66 (78.57) 18 (21.43)	0.02	0.89
Father and mother have smoked and are smoking	Yes No	14 (12.00) 103 (88.00)	7 (83.00) 77 (91.70)	0.69	0.41

Table 4. **Significant odds ratio parameters of the study**

Risk factor	Categories	Allergic women			Atopic women		
		Odds ratio	95% conf. interval	Pr>chisq	Odds ratio	95% conf. interval	Pr>chisq
Allergies in family	No	1	(1.431;5,251)	0.0022	1	(2.289;14.479)	0.0002
	Yes	2.742			5.757		
Father's allergy .	No	1	(1.359;13.365)	0.0129	1	(1.049;16.962)	0.0426
	Yes	4.261			4.218		
Soft furniture, carpets	No	1	(1.02;20.52)	0.047	Not significant		
	Yes	4577					
Pollinosis in the family	No	Not significant			1	(1.55;35.612)	0.0122
	Yes				7.429		

conditions, and the atopy of maternal and paternal relatives. All of the factors were evaluated by statistical analysis.

Maternal smoking during pregnancy and the smoking environment are known to be risk factors for elevated specific IgE (Bjerke et al., 1995, Jarvis et al., 1995). But it is in some cases difficult to evaluate the influences of maternal smoking after delivery as most of the mothers continue smoking. The additional effects of smoking on newborns are still unclear. However, we found no sensitization in our study because our mothers were smoking but little, the same as reported in other studies (Ownby et al., 1991, Lopez et al., 1999). In the present study, the frequency of missing data and those reported as unknown in family histories of atopic diseases was too high. It seems that the gravids we surveyed had no substantial information and background knowledge about atopic diseases. Our study has shown that environmental factors – mainly housing conditions – have an influence on allergy status.

CONCLUSIONS

1. The environmental factors are similar between healthy and allergic pregnant women; gas-fired heating ($p = 0.038$), dry flat ($p = 0.023$) of pregnant women influenced their health status.

2. The data on smoking habits were significant only in cases of smoking husbands.

3. The heredital factors of allergy were significant in the allergic women's group.

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ŽMOGAUS EKOLOGIJOS TYRIMAI: APLINKOS VEIKSNIŲ ĮTAKA NĖŠTUMUI

S a n t r a u k a

Tirtos 205 nėščiosios, suskirstytos į 3 grupes: sveikos, alergiškos ir atopiškos. Tirta įvairių aplinkos veiksnių poveikis jų įsijautrinimui. Nustatyta, kad alerginėmis ligomis sergantieji giminėje 2,742 karto padidina pacientės tikimybę patekti į alergiškųjų grupę, o tikimybę patekti į atopikų grupę – 5,757 karto. Alerginėmis ligomis sergantis tėvas 4,261 karto padidina tikimybę patekti į alergiškųjų grupę, o į atopikų grupę – 4,218 karto. Minkšti baldai, kilimai reikšmingi tik alergiškoms moterims: esant bute kilimams, minkštiems baldams, tikimybė priklausyti alergiškųjų grupei padidėja 4,577 karto. Šienligė giminėje – reikšmingas požymis atopikėms, nes šis veiksnys 7,429 karto padidina tikimybę patekti į atopikų grupę. Kitų tirtųjų aplinkos veiksnių (išsilavinimo, motinos, brolio, sesers sirgimo, gyvenimo mieste–kaime, mediniame–mūriniame name, blokiniame, naujame ar sename name, namo amžiaus, gyvenimo tame name trukmė, asmenų skaičiaus, gyvenamojo ploto, kambarių skaičiaus, buto sausumo ir drėgmės, šildymo tipo, oro tvankumo, pelėsių, gėlių bute, akvariumo bute, gamyklos netoliese, pelkių, miškų, vandens telkinių netoliese, įvairių kailinių, patalynės, kontaktų su gyvūnais) įtaka buvo nereikšminga.

Raktažodžiai: atopija, alergija, nėščiosios, sensibilizacija, ekologiniai veiksniai