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PREVALENCE AND CORRELATES OF ALLERGIC DISEASES AMONG CHILDREN

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The purpose of this paper was to determine the correlation between socioeconomic status, lifestyle, and the prevalence of allergic diseases in children. It was also checked whether there were any differences in the biological development rate between the children with allergies and their peers. The study is based on the data obtained from a cross-sectional surveys of 301 children aged 4-9. The number of children with allergies found as declared by their parents was 58 (19.3%). The prevalence of allergic children in the villages was significantly lower than in towns (12.8% vs. 26.2%). The more frequent occurrence of allergies in children also depended on the level of their parents' education, very good economic conditions, artificial feeding during the first months of their lives and attending nurseries. The children with diagnosed allergies did not differ from their peers by height, but had a higher body weight.

Key-words: *allergy, children, socioeconomic status*

INTRODUCTION

The prevalence of asthma and allergic diseases has increased significantly during the last decades, particularly in the rich and industrialized countries (1). Numerous studies indicate the tendencies of the occurrence of such diseases within the same families, which has become the foundation for the hypothesis on the genetic origin of them (2). The growth of the number of people with allergies, however, is too rapid to explain it by the variations of gene frequency in the population only. The fact that the same family members are not only linked by common genes, but also by common living environment, should also be taken into

the consideration. Although the latest studies show that the genetic factors predispose people to allergic diseases, the environmental factors have a significant influence on their occurrence and progression. Such factors include without limitation air pollution and home environment contamination (3-7). The lifestyle, including the type of diet in early childhood, also plays an important role.

The lifestyle and living standard largely depend on the social position. The studies intended to determine the correlations between the socioeconomic status (SES), lifestyle and living conditions and disease incidence provide definition of risk factors of particular diseases and point to preventive measures in order to restrict the frequency of such incidence (8, 9). Numerous papers on this subject refer to allergic diseases (3, 7, 9). The issue was also raised in the studies presented herein. The purpose of this paper was to determine the frequency and incidence risk factors of allergies among pre-school and early-school children and to find out whether there are any differences in the biological development rate, depending on their occurrence.

MATERIAL AND METHODS

The study conformed to the Declaration of Helsinki for Human Research and all subjects gave informed consent. The study was approved of a local Ethics Committee.

The data were obtained during the cross-sectional studies carried out in the years 2007-2008 among children aged 4-9. The research was carried out in primary schools and kindergartens in the urban and rural communities of Southern Poland. The number of children surveyed was 301 (149 girls and 152 boys). The height and body mass were measured in each child and the BMI was calculated. The characteristics served for the assessment of the biological development progress. The questionnaire filled out by the parents included questions on the frequency of allergy occurrence in the child, its brothers/sisters and parents. In all the cases the parents were asked whether any medical tests carried out in them or their children showed the occurrence of allergy and what factors they were allergic to.

The questions included in the questionnaire also concerned the socioeconomic status and selected lifestyle elements. The socioeconomic position was determined in virtue of three variables: mother's education, father's education, and self-assessment of their own economic situation. The parents' education was considered in three categories: vocational, secondary, and university. The surveyed population assessed their situation as very good, good, average, and below average. 18 people (6.8%) did not answer the question or chose the suggested reply variant "it is difficult to say". Among the factors related to lifestyle, particular attention was paid to the child's exposure to tobacco smoke, the way of feeding the child during the first months of its life (breast-feeding, artificial milk feeding), the type of diet selected by the mother during pregnancy and breast-feeding of the child.

The anthropometric data were used for the assessment of the rate of biological development. The body height values and BMI of the surveyed children were standardized in relation to the references of the Institute of Mother and Child in Warsaw (10). It helped to carry out the statistical analysis for the whole group, disregarding the division by age or gender.

The significance of differences in the frequency of allergy incidence, depending on the genetic or environmental factors analyzed, was estimated by Chi-square test. The difference in the

developmental rate, depending on the prevalence of allergies was assessed with the use of one-way analysis of variance. $P < 0.01$ was taken as indicative of the significant differences.

RESULTS

Prevalence of allergies within the group analyzed

The occurrence of allergies was found in 58 (19.3%) children. As declared by the parents, asthma was found in 2 persons, inhalatory allergy in 25, food allergy in 12, both types of allergy in 14, contact allergy in 3 (cosmetics, washing powders), and 2 children were allergic to medicines. No dimorphic differences were found concerning the frequency of allergies, therefore no division by gender was applied in further analysis.

Prevalence of allergies in relation to genetic and environmental factors

The first issue analyzed was the prevalence of allergies in families. Allergy in either the mother or the father facilitated the occurrence of allergy in the child (*Table 1*). Great similarity in this aspect was also observed in brothers/sisters (*Table 1*). The results confirm the thesis on the genetic conditions for allergies. However, numerous papers also indicate the great role of the environmental factors. The results also indicate the influence of the socioeconomic status (*Table 2*).

The frequency of allergy incidence in rural children was much lower than among urban children (12.8% vs. 26.2%). In case of the variable “parents’ education”, the most frequent incidence of allergies was observed in children whose mothers or fathers had university education. The assessment of the financial conditions also indicated a connection with the frequency of allergies in the children (*Table 2*). Summarizing, allergy was by far more frequent among

Table 1. The incidence of allergies in families.

Factor	Category	Allergy incidence in children		The values of Chi-square test
		No	Yes	
		n (%)	n (%)	
Allergy incidence in parents	None	224 (86.8)	34 (13.2)	$\chi^2 = 51.07$, df=2 P=0.0001
	One	18 (52.9)	16 (47.1)	
	Both	1 (11.1)	8 (88.9)	
Allergy incidence in mother	No	232 (84.6)	42 (15.4)	$\chi^2 = 30.49$, df=1 P=0.0001
	Yes	11 (40.7)	16 (59.3)	
Allergy incidence in father	No	234 (84.8)	42 (15.2)	$\chi^2 = 35.07$, df=1 p=0.0001
	Yes	9 (34.0)	16 (64.0)	
Allergy incidence in siblings	No	198 (88.0)	27 (12.0)	$\chi^2 = 32.11$, df=2 P=0.0001
	Yes	13 (36.2)	23 (63.8)	
	Lack of siblings	32 (80.0)	8 (20.0)	

Table 2. Prevalence of allergy among children in relation to SES and lifestyle.

Factor	Category	Allergy incidence in children		The values of Chi-square test
		No	Yes	
		n (%)	n (%)	
Dwelling place	Rural	136 (87.2)	20 (12.8)	$\chi^2 = 12.96$, df=1 P=0.0003
	Urban	107 (73.8)	38 (26.2)	
Mother's education	Vocational	119 (88.1)	16 (11.9)	$\chi^2 = 19.34$, df=2 P=0.0001
	Secondary	85 (88.5)	18 (17.5)	
	University	39 (61.9)	24 (38.1)	
Father's education	Vocational	143 (88.8)	18 (11.2)	$\chi^2 = 16.76$, df=2 P=0.0002
	Secondary	69 (75.0)	23 (25.0)	
	University	31 (64.6)	17 (35.4)	
Economic status	Below average	17 (85.0)	3 (15.0)	$\chi^2 = 0.73$, df=3 P=0.8660
	Average	117 (81.3)	27 (18.7)	
	Good	64 (79.0)	17 (21.0)	
	Very good	12 (75.0)	4 (25.0)	
SES	Low	44 (88.0)	6 (12.0)	$\chi^2 = 18.26$, df=2 P=0.0001
	Average	122 (86.5)	19 (13.5)	
	High	50 (64.1)	28 (35.9)	
Mother was smoking before pregnancy	No	214 (83.9)	41 (16.1)	$\chi^2 = 0.40$, df=1 P=0.5251
	Yes	29 (63.1)	17 (36.9)	
Mother was smoking during pregnancy	No	231 (80.7)	55 (19.2)	$\chi^2 = 0.84$, df=1 P=0.6254
	Yes	12 (80.0)	3 (20.0)	
Passive smoking	No	107 (85.6)	18 (14.4)	$\chi^2 = 0.28$ df=1 P=0.5972
	Yes	136 (77.5)	40 (22.7)	
Breast feeding	No	43 (67.2)	21 (32.8)	$\chi^2 = 0.23$ df=1 P=0.6283
	Yes	200 (84.4)	37 (15.6)	
Nurseries attendance	No	231 (81.5)	56 (19.5)	$\chi^2 = 0.43$ df=1 P=0.4823
	Yes	12 (85.7)	2 (14.3)	
Diet	No	212 (80.6)	51 (19.4)	$\chi^2 = 0.89$, df=1 P=0.7982
	Yes	31 (81.6)	7 (18.4)	

children from families with a high socioeconomic status. The differences were statistically significant.

The last variable analyzed was related to the lifestyle (Table 2). It was found that allergic diseases were more frequent among children whose mothers smoked prior to pregnancy. In case of smoking during pregnancy, the results raise some objections. It seems that some of the women gave a false answer, because women seldom admit to have smoked during pregnancy. The allergic diseases were more frequent in children who are passive smokers, less frequently in children who were breast-fed and in children who attended nurseries (Table 2). Few women declared the application of a diet in which the allergenic products were eliminated. Only 2 persons were on such diet while being pregnant and 19 during breast-feeding. No differences in allergy incidence were observed, depending on the application of diet while being pregnant.

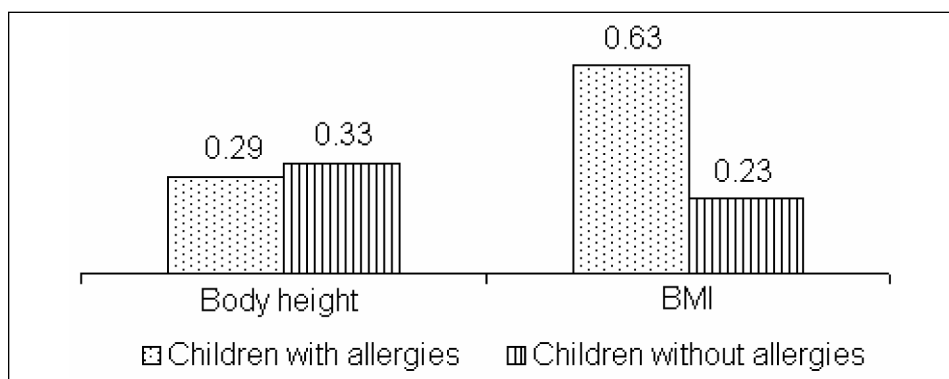


Fig. 1. Standardized values of body height and BMI of the children surveyed.

Association between allergy incidence and biological development

The standardized anthropometric data were presented in Fig. 1. No significant differences were in body height ($F=0.01$, $P=0.9318$) and BMI ($F=1.01$, $P=0.3156$) between the children without allergies and children with allergies diagnosed. The latter, however, had relative body mass slightly increased.

DISCUSSION

The estimated population with asthma or allergies diagnosed globally is almost 700 million. They are not the cause of high death rate, but affect the quality of life significantly. (1). The results of numerous tests, including those presented herein indicate that genetic factors largely determine allergy incidence (2). Allergy in one or both parents increases the risk of its occurrence in the child.

On the other hand, however, the environmental contribution is emphasized (3-9). High variability of the incidence frequency throughout particular countries is observed. A higher incidence was observed in societies with high average living standard (11-14). Migliore *et al.* (15) highlight the great role of „westernization” in the development of the diseases. The correlation is not only visible in the global studies, but is also expressed in the differences between regions or even cities within the territory of one country.

The differences in the frequency of allergies between urban and rural environments were noted. The results of the tests presented comply with the data published in scientific references proving that allergies are less common in villages than in the cities (16, 17). A large group of reports concerns the influence of the socioeconomic status on the prevalence of the diseases. Within the group surveyed, allergies were more frequent among children from families of a high status. Such tests, however, have certain restrictions. They are based on survey

data. It is obvious that parents with university education and higher income pay more attention to the regular control of their children's health condition, they also have funds to provide their child with appropriate medical care. It is possible that detection of allergies was much higher in the group of high status, particularly in cases of a slight intensification of the disease. The reference data, however, also indicate the strict connection between allergies and the high status (3, 11). The differences are conspicuous in both developed and developing countries. Allergic diseases are more frequent among people with high income, the exception being asthma only, more often diagnosed in people with low income (11-13). The influence of environmental factors on spread of allergies is confirmed by the studies of Migiliore *et al.* (15). The authors observed higher frequency of allergies among the children born in Italy than in those who were born elsewhere and lived in Italy. The difference, however, referred to the children only who lived in Italy for a period shorter than 5 years (15).

The socioeconomic status is not the direct risk factor. It is rather an indicator of the living conditions and lifestyle, comprising without limitation the nutrition habits, access to medical care, housing conditions, including exposure to allergens. Among the latter factors, this paper analyzed the method of the child's nutrition and exposure to tobacco smoke. Numerous studies indicate the fact that passive smoking increases the risk of allergy occurrence in the child (4, 7, 18). In case of breast-feeding, the results are not explicit. Some of the papers show that it reduces the risk of allergy, some others state that it only delays the age of allergy occurrence (19). The information on infectious disease incidence in early childhood and later allergy occurrence is unclear as well. One of the hypotheses assumes that more frequent exposure to infections prevents atopy (20). Fewer cases are observed in children who are in frequent contact with other children and, in consequence, suffer from more frequent infections, e.g., in children with many siblings or children brought up in orphanages (21). Such hypothesis also explains less frequent incidence of allergies in children who attended nurseries.

The results of the tests presented and reference data show that the development of allergies is correlated to high status. It is also thought that allergies may be a consequence of the biological development acceleration in families of a high socioeconomic status, the immune system, in particular. The physical development of children with allergies diagnosed has become the topic of several recent papers. There was no a significant difference in the mean height and BMI of children with allergies and theirs peers. However, the BMI values are slightly higher in allergic children, which may be the consequence of medicines taken.

The results of the work presented herein show that environmental factors largely contribute to the development of allergies, in addition to the genetic factors. The tests presented are pilot tests. When more material has been collected, it will be possible to carry out the analysis whether the correlation between the socioeconomic status, the living standard and lifestyle and, on the

other side, disease incidence is the same for all types of allergy. In consequence, it will allow for indication of groups particularly exposed to allergic diseases and listing of risk factors.

Conflicts of interest: No conflicts of interest were declared in relation to this paper.

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