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*The incidence of airways allergic diseases in the region of Lublin  
regarding the level of environmental pollution*

Most of the epidemiological research conducted in the developed countries in Europe and in other parts of the world indicate the increasing incidence of allergic diseases in the population of both adults and children (11). Such studies are a source of information needed to estimate the inclination to occurrence of an individual disease entity (20), to plan medical service development, and to evaluate related social costs. In the region of Lublin, epidemiological research was carried out earlier among school children (9).

MATERIAL AND METHODS

Tests evaluating both the incidence of allergic diseases and their symptoms should be repeated periodically. In Poland, there are no current epidemiological indicators of allergic disease occurrence (14). Therefore, such studies were conducted in eleven clinical centres around Poland. One of the centres participating in the research project was that of the region of Lublin.

In 1999-2000, the questionnaires were distributed among subjects living in three representative districts of the region of Lublin selected on the basis of data concerning the level of environmental pollution. The following districts: district 1 (Nałęczów) of the lowest level of pollution, district 2 (Puławy) of a medium level of pollution, and district 3 (Lublin) of the highest level of pollution, were selected. In those districts, the addresses of the households were chosen by chance so that the questionnaires were distributed to a group of 1500 subjects, 500 in each district. The study consisted of the two following parts: acquiring data by means of standardized questionnaires, and afterwards – verification of preliminary diagnosis given on their basis by a physician. The physician also used the data from a patient's medical history, available documentation, and additional studies.

A statistical analysis was carried out using STATISTICA 5.1. The ANOVA variance analysis was used for intergroup comparison of the results of continuous variables (e.g. age). Nominal variables were compared using the  $\chi^2$  test.

RESULTS

Among 1 664 subjects selected for the study, the data were obtained from 1 511 (90.8%; 1 223 adults and 288 children). Table 1 presents demographic characterization of the districts.

Table 1. Demographic characterization of examined subjects

District	Total number (%)	Adults (%)	Children (%)	Adults' age (95% confidence limit)
District 1	436 (28.9%)	376 (30.7%)	60 (20.8%)	44.0 42.2-45.7
District 2	498 (33.0%)	404 (33.0%)	94 (32.6%)	41.2 39.5-42.8
District 3	577 (38.2%)	443 (36.2%)	134 (46.5%)	45.6 44.0-47.2
Total value	1511	1223	288	43.6 42.7-44.6

Table 2. Prevalence of airways allergic diseases in adults from the region of Lublin

Disease	Number of patients	% (95% confidence limit)
Bronchial asthma	68	5.60 (4.3-6.8)
Allergic rhinitis	82	6.70 (5.3-8.1)
Perennial rhinitis	35	2.90 (1.9-3.8)
Number of subjects	1223	

Table 3. Prevalence of airways allergic diseases in adults from the region of Lublin regarding three districts of a different level of environmental pollution

Disease	District 1		District 2		District 3	
	number of patients	% (95% confidence limit)	number of patients	% (95% confidence limit)	number of patients	% (95% confidence limit)
Bronchial asthma	27	7.2 (4.6-9.8)	21	5.2 (3.0-7.4)	20	4.5 (2.6-6.4)
Allergic rhinitis	34	9 (6.1-11.9)	12	3 (1.3-4.6)	36	8.1 (5.6-10.7)
Perennial rhinitis	6	1.6 (0.3-2.9)	8	2 (0.6-3.3)	21	4.7 (2.8-6.7)
Number of subjects	376		404		443	

There were no age differences between groups of adults and children from each district. Similarly, insignificant sex differences were observed among individual districts analyzed. Among 1 223 adults, allergic disease was diagnosed in 182 subjects (14.9%). Allergic rhinitis was the most frequent allergic disease affecting 82 subjects (6.7%). 68 patients (5.6%) suffered from bronchial asthma, which was less frequently present among the examined individuals.

Perennial rhinitis was diagnosed in 35 subjects (2.9%) – Tab. 2. The incidence of asthma among adults was similar in all analyzed districts. Table 3 presents the number and percentage coefficients of the frequency of airways allergic diseases in each district. Significantly less frequent incidence of allergic rhinitis was ascertained in district 2 ( $p < 0.005$ ) in comparison with districts 1 and 3. When comparing the incidence of airways allergic diseases among women and men, the prevalence of asthma and perennial rhinitis was similar (5.2% vs. 5.9% and 2.2% vs. 3.5%, respectively). Allergic rhinitis was diagnosed significantly more often ( $p = 0.03$ ) in female patients than in male subjects (8.2 vs. 5.1%) – Tab. 4.

Table 4. Airways allergic diseases in the region of Lublin among male and female patients

Disease	Men		Women	
	number of patients	% (95% confidence limit)	number of patients	% (95% confidence limit)
Bronchial asthma	31	5.2 (3.4-7.0)	37	5.9 (4.0-7.7)
Allergic rhinitis	30	5.1 (3.3-6.8)	52	8.2 (6.1-10.4)
Perennial rhinitis	13	2.2 (1.0-3.4)	22	3.5 (2.1-4.9)
Number of subjects	591		632	

The examined population sample comprised 288 children. There was a significant difference regarding the number of subjects examined in individual districts – the greatest number of children was examined in districts 3, and the lowest – in 1 (Tab. 5). Among airways allergic diseases, children were mostly affected by asthma (7.6%), and by allergic rhinitis (5.6%), whereas perennial rhinitis was diagnosed only in 4 individuals (1.4%). The incidence of asthma was definitely higher in district 2 (industrial-urban area) having a value of 16%, than in district 3 (rural-industrial area) characterized by a value of 1.5% ( $p = 0.0001$ ).

Table 5. Prevalence of airways allergic diseases among children in the region of Lublin

Disease	Total number/value		District 1		District 2		District 3	
	Patients n	% (95% confidence limit)	n	% (95% confidence limit)	n	% (95% confidence limit)	n	% (95% confidence limit)
Bronchial asthma	22	7.6 (4.6-10.7)	5	8.3 (1.3-15.3)	15	16 (8.6-23.4)	2	1.5 (0.0-3.5)
Allergic rhinitis	16	5.6 (2.9-8.2)	6	10 (2.4-17.6)	6	6.4 (1.4-11.3)	4	3 (0.1-5.9)
Perennial rhinitis	4	1.4 (0.0-2.7)	0	0	4	4.3 (0.2-8.3)	0	0
Number of subjects	288		60		94		134	

When dividing the group of children into girls (n=133) and boys (n=155), the significant differences in the incidence of airways allergic diseases were not found. Bronchial asthma was diagnosed in nine girls (6.8%) and 13 boys (8.4%), whereas allergic rhinitis – in eight (6%) vs. eight (5.2%), respectively, while perennial rhinitis – only in the case of one girl and three boys. The results are presented in Table 6.

Table 6. Prevalence of airways allergic diseases among children regarding their gender

Disease	Boys		Girls	
	number of patients	% (95% confidence limit)	number of patients	% (95% confidence limit)
Bronchial asthma	13	8.4 (4.0-12.8)	9	6.8 (2.5-11.0)
Allergic rhinitis	8	5.2 (1.7-8.6)	8	6 (2.0-10.1)
Perennial rhinitis	3	1.9 (0.0-4.1)	1	0.8 (0.0-2.2)
Number of subjects	155		133	

## DISCUSSION

During asthma remission, the symptoms of the disease are rather faint. Therefore, the comparison of the prevalence of the disease with the cumulative prevalence (i.e. based on the patient's medical history) can give very different results, especially when adults are examined (13). For instance, in Denmark, in a group of patients above 16, the prevalence of asthma had a value of 3.8%, whereas it was evaluated as 5.2% when the patients' medical history was considered (21). In the region of Lublin, the incidence of asthma among school children, with regard to the environment of living (i.e. rural or urban), was evaluated. In the research conducted by Emeryk et al., asthma was diagnosed in 2.5% of children (9). Regarding the results of other studies, the incidence of the disease usually does not exceed 5% (3, 10). Genetic factors are acknowledged as the risk factors for bronchial asthma development. Among other factors, air pollution, tobacco smoke exposure as well as allergen exposure in the home environment and infections in the childhood are also taken into account (17). The main air pollutant resulting in an increase in the incidence of asthma is SO<sub>2</sub>, which is responsible for a 2-, 3-fold increase in asthma incidence in an industrial area, or in the city (14). Moreover, some authors emphasize the influence of tobacco smoking by members of the household, especially by mother (19).

The incidence of asthma in the subjects above 20 is usually lower than in children. In Płock, in the study of a population sample comprising the individuals above 30, the non-complicated asthma was diagnosed in 2.5% of examined patients (14). In Oslo, in the age group of 16-65 years, asthma was diagnosed in 1.4% of subjects, whereas in Sweden, in the age-similar group of patients, the prevalence of the disease was evaluated as 2%. These values are much lower than those obtained in our study. That difference may be explained by the fact that the researches were conducted in the seventies. In Sweden, the prevalence of asthma in children was estimated as 4% already in the nineties (2). When comparing changes in the prevalence of asthma among adult Copenhagen citizens in 1976-1994, Godtfredsen et al. noticed an increase in that coefficient from 1.2 to 4.2% (11). Ciprandi, when analyzing the frequency of asthma among the recruits in Italy in 1990-1998, found an increase in asthma incidence from 4.6 to 7% (5). In the study of Upton et al., conducted between 1972 and 1996, concerning the British

population, more than a two-fold increase (from 3 to 8.2%) in the incidence of asthma was observed (20). Some authors notice that asthma epidemiological coefficients have lower values in the countries of Eastern Europe in comparison with the values observed in Western Europe (15,16). In adult citizens of Estonia, asthma incidence has a value of approximately 2%. The study concerning young black inhabitants of small villages of Rhodesia revealed slightly lower prevalence of asthma, i.e. 1.4% (6). In the group of older subjects (i.e. above 70), the incidence of asthma had a high value (4) of even 3.9%. In some occupational groups, in the case of farmers for instance, asthma prevalence is even higher. In the study of Swedish farmers, asthma was diagnosed in 15.4% of individuals (8).

Allergic rhinitis was diagnosed in 6.7% of adults and 5.6% of children of the group of subjects examined in our study. The obtained coefficients have lower values in comparison with analogous ones obtained in the studies of British and Italian investigators, where allergic rhinitis was diagnosed in 10.1–20.5% of children (7,18). On the other hand, our results approximate those revealed in the study of Goh et al. concerning Singapore population, i.e. 6.3% (12). Analogous coefficients for allergic rhinitis were also observed in a research focusing on 10–11-year-old Estonian children; in 1993, allergic rhinitis was diagnosed in 7.4% of subjects, whereas in 1997 – in 6.1%. The studies regarding the populations of South Africa and Sweden indicate higher frequency of allergic rhinitis affecting patients from these countries (i.e., 31 and 14%, respectively) (3).

In the study by Upton concerning the British population, the incidence of allergic rhinitis increased over the last 20 years from 5.8% to 19.9% among non-smokers, and from 5.3 to 15.5% among smokers, that is three times (20). We observed higher disease incidence among subjects from rural areas and from the lower level of environmental pollution (9% vs. 3%, respectively). The study of Austin et al. regarding the prevalence of allergic rhinitis in different regions of Great Britain showed that neither the environment of living (rural/urban area) nor the geographical region had an influence on the disease prevalence (1).

Most frequently, allergy manifests itself within the respiratory system. There is no significant difference between the prevalence of the disease in the region of Lublin ascertained in our study and the values obtained for the neighbouring countries. The problem of trends in the morbidity rate of allergic diseases is also very important. These can be observed by repeating the epidemiological studies after some period of time, e.g. after 5 years.

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## SUMMARY

Basing on the standard questionnaires, the incidence of bronchial asthma, seasonal and perennial rhinitis in the population sample of the region of Lublin was evaluated. The study involved a group of 1 511 subjects – 500 from each of the three distinct districts (Nałęczów, Puławy, Motycz-Lublin) chosen considering the level of industrial pollution. The information was obtained from 1 223 adults (376, 404 and 443, respectively) and 288 children (60, 94 and 134, respectively). Bronchial asthma was diagnosed in 68 adults (5.6%) and 22 children (7.6%). Allergic rhinitis incidence had a value of 6.7% in adults and 5.6% in children, whereas the incidence of perennial rhinitis was estimated as 2.9% and 1.4%, respectively. Among adults, there was no difference in the incidence of bronchial asthma in each district. Allergic rhinitis was diagnosed more often in rural than in urban areas ( $p < 0.005$ ). Among children, asthma was diagnosed significantly more often in the industrial-urban district (Puławy) with incidence value of 16% than in the rural-industrial district (Motycz-Lublin) with the value of 1.5% ( $p = 0.0001$ ).

**Występowanie chorób alergicznych układu oddechowego na Lubelszczyźnie  
z uwzględnieniem stopnia zanieczyszczenia środowiska**

Na podstawie zebranych przez ankieterów standardowych kwestionariuszy szacowano występowanie astmy oskrzelowej, kataru sezonowego i całorocznego na Lubelszczyźnie. Badaniem przesiewowym objęto 1511 osób po 500 w trzech różnych rejonach (Nałęczów, Puławy, Motycz-Lublin), wybranych ze względu na uzyskane informacje o zanieczyszczeniu przemysłowym tych regionów. Łącznie uzyskano informację od 1223 osób dorosłych (odpowiednio 376,404,443) i 288 dzieci (odpowiednio 60,94,134). Astmę oskrzelową stwierdzono u 68 dorosłych (5,6%) i 22 (7,6%) dzieci. Zachorowalność na katar sienny wyniosła 6,7% u dorosłych i 5,6% u dzieci, natomiast dla kataru całorocznego odpowiednie wskaźniki u dorosłych i dzieci wyniosły odpowiednio 2,9% i 1,4%. Wśród dorosłych nie obserwowano zróżnicowania częstości występowania astmy oskrzelowej w poszczególnych rejonach. Katar sienny częściej występował w środowisku wiejskim niż miejskim ( $p < 0,005$ ). Natomiast wśród dzieci astmę obserwowano zdecydowanie częściej w rejonie przemysłowo-miejskim (Puławy), gdzie zachorowalność wyniosła 16%, aniżeli w rejonie wiejsko-przemysłowym (Motycz-Lublin), gdzie wskaźnik ten wyniósł 1,5% ( $p = 0,0001$ ).