

## PREVALENCE OF ASTHMA AND SOME RESPIRATORY SYMPTOMS IN THE YEARS 1995 AND 2001 IN SCHOOLCHILDREN FROM RURAL REGIONS OF POLAND

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**Abstract:** The aim of our study was to estimate the prevalence of asthma and some respiratory symptoms and diseases in schoolchildren from rural regions of Poland in 2001 and to compare these data with previous estimations in 1995. Repeated cross-sectional epidemiological studies were performed among 594 primary schoolchildren in 1995 and 541 in 2001 using the same standardized questionnaire. Lifetime prevalence of “doctor’s-diagnosed asthma” increased significantly from 3.4% in 1995 to 9.6% in 2001. This trend may be due to the real increase in the prevalence of asthma and also may be a result of better physician’s diagnosis and/or better parents’ health education. A substantial increase of asthma-related symptoms (post-exercise breathlessness, wheezing and dyspnoea) was also observed between these years (8.3–17.7%, 6.2–13.2% and 7.6–13.3%, respectively). These results suggest that asthma in Polish schoolchildren is still underdiagnosed.

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The prevalence of allergic diseases and asthma has increased dramatically during the recent 3 decades in industrialized countries [1, 10]. Asthma and allergic rhinitis have become more prevalent mainly among schoolchildren and young people [28]. There are a number of epidemiological studies showing the increasing prevalence of asthma in schoolchildren in the last decades in different parts of the world, e.g. from Scotland [21], Sweden [2], Israel [9], Australia [22], Costa Rica [27] and Germany [20]. However, the epidemiological data from developing countries of Eastern Europe are still fragmentary [8, 15, 32].

Written questionnaires on asthma and asthma-like symptoms have been widely used in large or small

epidemiological studies in children and adults [8, 23, 26, 28]. So far in Poland there have been no epidemiological questionnaire studies concerning changes in the short-term prevalence of allergic diseases and asthma in schoolchildren living in rural regions. Some research has been done in children from urban regions [3, 8]. The most recently published are the results of the Polish part of the International Study of Asthma and Allergies in Childhood (ISAAC) conducted in 1994–1995 (phase I) and 2001/2002 (phase III) [3]. In this study, a substantial increase in cumulative prevalence of asthma in children from urban regions has been observed.

The aim of our study was to estimate the prevalence of asthma, asthma-related symptoms and other respiratory

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diseases such as pneumonia and bronchitis in schoolchildren from rural regions of Poland in 2001, and to compare the results with those of 1995 [6, 7].

## MATERIALS AND METHODS

A repeated cross-sectional epidemiological study was performed in 1995 and 2001. The survey was conducted in the same population of children randomly selected from the same primary school in Janów Lubelski, and using the same written questionnaire. The children were aged 8–13. In 1995, 594 children were examined: 296 (49.8%) girls and 298 (50.2%) boys. The study performed in 2001 included 541 children: 264 (48.8%) boys and 277 (51.2%) girls (Tab. 1).

The questionnaire was based on a modified version of the European Community Respiratory Health Survey (ECRHS) asthma and respiratory symptoms questionnaire [4, 23]. It consisted of 72 questions in 4 main parts and included: 1) personal data of the child and parents, 2) prevalence of respiratory symptoms or diseases and their treatment, 3) prevalence of asthma diagnosis, asthma symptoms, symptoms of seasonal and perennial allergic rhinitis and skin prick tests results, 4) home environmental factors. The questionnaire was completed by the children's parents. The response rate was 95.0% in 1995 and 85.2% in 2001.

This paper presents only a part of our wider study concerning changes in the prevalence of asthma and some important respiratory symptoms and respiratory diseases in schoolchildren living Janów Lubelski commune. In our study, diagnosis of asthma was based on physicians' asthma diagnosis. We estimated the cumulative prevalence (lifetime prevalence) of asthma, bronchitis, pneumoniae, post-exercise breathlessness, wheezing and dyspnoea.

For statistical analyses we processed the obtained results using Microsoft Excel XP and Statistica 3.1 programmes. The  $\chi^2$  test was used for comparison of dichotomous variables, with  $p < 0.05$  considered statistically significant.

**Table 1.** Demographic characteristic of the examined population of children.

Year of the study	1995	2001
Number of examined children (n)	594	541
Sex, n (%)		
boys	298 (50.2)	264 (48.8)
girls	296 (49.8)	277 (51.2)
Age group, n (%)		
8–9	241 (40.6)	102 (18.9)
10–11	219 (36.9)	211 (39.0)
12–13	134 (22.5)	228 (42.1)
Response rate (%)	95.0	85.2

## RESULTS

The principal results of our study are presented in Table 2 and Figures as a percentage of all children examined. Cumulative prevalence of asthma increased significantly from 3.4% in 1995 to 9.6% in 2001; this difference between the results was statistically significant ( $p < 0.0001$ ). We also observed a substantial increase in the prevalence of asthma-related symptoms: post-exercise breathlessness increased from 8.3% in 1995 to 17.7% in 2001 ( $p < 0.001$ ), wheezing from 6.2% to 13.1% ( $p < 0.0001$ ) and dyspnoea from 7.6% to 13.3%, respectively ( $p < 0.0021$ ). However, no difference in cumulative prevalence of other respiratory diseases such as pneumonia and bronchitis was found in our study between 1995 and 2001 ( $p > 0.05$ ).

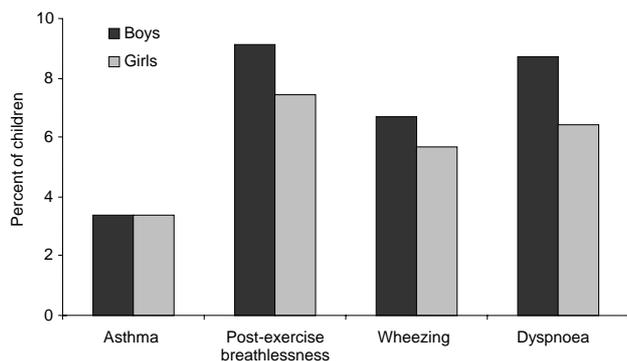
The prevalence of asthma and asthma-related symptoms stratified for sex are presented in Figure 1 (data from 1995) and Figure 2 (data from 2001). However, asthma-related symptoms occurred more frequently in boys than in girls, although the difference was not statistically significant ( $p > 0.05$ ), both in 1995 and in 2001.

## DISCUSSION

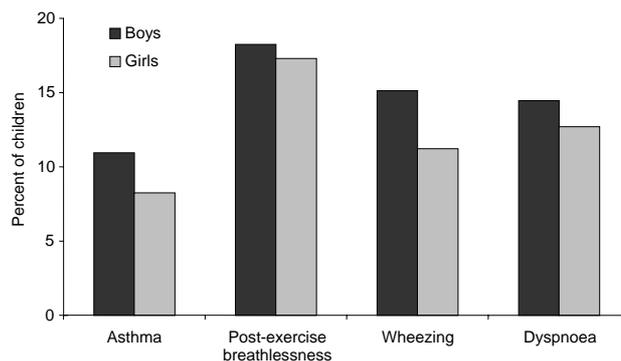
The incidence of asthma has gradually increased over the past three decades; this has now risen to approximately 5% in adults and up to 10–15% in children [14, 18, 33]. Genetic factors are important in the development of childhood asthma, but these rapid changes over recent years can only be explained by the changes which have occurred in the environment: increased levels of pollutants, climatic changes, changes in lifestyle ("western life style") or some infections and diet [12, 17]. On the other hand, some studies have shown that growing up on a farm and/or regular contact with farm animals could protect children against allergic sensitization and some allergic diseases [16, 30] or even atopic children living on a farm could lose their allergic skin prick test positivity [11]. It seems that this protective

**Table 2.** Prevalence of asthma and some respiratory symptoms and respiratory diseases in 1995 and 2001.

Disease/symptoms (ever in life)	Prevalence, %		Significance
	1995 (n = 594)	2001 (n = 541)	
Asthma	3.4	9.6	$p < 0.0001$
Post-exercise breathlessness	8.3	17.7	$p < 0.001$
Wheezing	6.2	13.1	$p < 0.0001$
Dyspnoea	7.6	13.3	$p < 0.0021$
Bronchitis	37.2	41.4	$p = 0.16$
Pneumonia	19.4	22.2	$p = 0.27$



**Figure 1.** Prevalence of asthma and asthma-related symptoms in boys and girls in 1995.



**Figure 2.** Prevalence of asthma and asthma-related symptoms in boys and girls in 2001.

effect of living on a farm may depend on, among others, environmental factors, e.g. high concentration of endotoxin or other bacterial components [31]. It is also known that farmers and their children are more exposed to a higher concentration of house dust mites and storage mites than urban citizens [25], which may partially explain the high asthma prevalence among farmers' children.

Repeated epidemiological studies in the same group of children enable exact estimation of asthma morbidity and prevalence, minimizing errors resulting from genetic, geographical and environmental differences between the group examined [20]. Written questionnaires, filled in by the parents, are most frequently used for this purpose. Less popular are telephone or video-assisted questionnaires [20, 28, 29]. In our study, a modified and validated version of the ECRHS questionnaire was used, which has been described earlier [23]. A high questionnaire response rate was reached (85–95%), which is comparable to the results of other studies in children [14, 19, 34] and in adults [5]. The calculation of the lifetime prevalence of asthma was based on a positive answer to the question: "Has the child ever been diagnosed with asthma?" (physician's diagnosis). The question of "doctors'-diagnosed asthma" has been shown to have a positive predictive value and specificity in the diagnosis of asthma, especially current asthma [13].

In our study we examined groups of children from typical Polish rural areas. The children were not brought up in typical farming environments, but on traditional, rather modern farms, where the house is separated from the stable, cow-barn and pigsty. The community of Janów Lubelski is a typical rural region in the eastern part of Poland with a population of about 17,000 inhabitants. Its area of about 18,000 hectares includes 60% forest and 26% arable and mainly small, individual farms.

Our results indicate that the cumulative prevalence of asthma in schoolchildren increased significantly from 3.4% in 1995 to 9.6% in 2001. A similar increase within the last 7 years was observed by Bręborowicz *et al.* among schoolchildren from large cities [3]. The results of the recently published studies of III Phase ISAAC showed a twofold increase in asthma prevalence in schoolchildren

aged 6–7 and 13–14 living in Cracow and almost a threefold increase in those in Poznań.

In our study, the prevalence of asthma and asthma-related symptoms was higher in boys than in girls; however, our results did not reach the level of statistical significance. These results are in accordance with data from other studies [20].

We have also found a more than twofold increase in the prevalence of asthma-related symptoms, such as post-exercise breathlessness, wheezing or dyspnoea. In comparison with asthma prevalence, this may suggest that asthma was underdiagnosed both in 1995 and 2001, or that there is a real increase of asthma prevalence, not only caused by better physician diagnosis. However, interpretation of these results must be cautious because rather low specificity of asthma-related symptoms raises other questions and needs further investigation.

Over the last decade Poland has been undergoing gradual changes in living conditions and lifestyle, also in the rural areas. People are more exposed to the effects of pollution owing to the rapid development of motor transport, the use of versatile chemical substances in industry and agriculture, as well as for domestic purposes. The above-mentioned factors combined with a so-called "western lifestyle" and a decrease in physical activity of children, may explain the increase in the incidence of asthma in the group examined [24]. These hypotheses, however, should be proved by further studies of the environmental conditioning of asthma prevalence in Polish children.

## CONCLUSIONS

Prevalence of asthma and some asthma-related symptoms (but not pneumonia and bronchitis) significantly increased between the years 1995 and 2001 in schoolchildren living in rural regions of Poland. This trend may be due to the real increase in the prevalence of asthma, but also may be the result of more accurate physician's diagnosis and/or better parents' health education. Nevertheless, asthma in schoolchildren still seems to be underdiagnosed.

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