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Increasing prevalence of asthma, respiratory symptoms, and allergic diseases: Four repeated surveys from 1993-2014

Grzegorz Brozek [a,*], Joshua Lawson [b], Dawid Szumilas [a], Jan Zejda [a]

[a] Department of Epidemiology, School of Medicine, Medical University of Silesia in Katowice, Medykow 18 Str, 40-752 Katowice, Poland
[b] Department of Medicine and Canadian Center for Health and Safety in Agriculture, University of Saskatchewan, 104 Clinic Place, PO Box 23, Saskatoon, SK S7N 2Z4, Canada

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Summary
Background: Published data shows different prevalence trends depending on the region of Europe.
Aim: The aim of the study was to analyze time trends of the frequency of the respiratory symptoms and allergic diseases in school children (Silesia, Poland) over the last 21 years.
Methods: We compared the results of four population-based surveys performed in a town of Chorzow in 1993, 2002, 2007 and 2014 in children aged 7–10 years. All four studies had the same study protocol, recruitment (cluster, school-based sampling), questionnaire (WHO respiratory health questionnaire) and the same principal investigator The surveys included 1130 children in 1993, 1421 children in 2002, 1661 children in 2007 and 1698 in 2014.
Results: The results covered a 21 year span and showed a statistically significant ($p < 0.05$) increase in the prevalence of the following physician-diagnosed disorders (1993-2002-2007-2014): asthma (3.4%-4.8%-8.6%-12,6%); allergic rhinitis (4.3%-11.9%-15.9%–13.9%); atopic dermatitis (3.6%-7.9%-12.0%–13.9%); allergic conjunctivitis (4.3%-7.9%-8.3%–7.9%); A simultaneous increasing trend ($p < 0.05$) in the attacks of dyspnea (3.9%-5.9%-7.0%–7.3%) and symptoms (wheeze, dyspnea, cough) induced by exercise (7.5%-10.6%-22.0%–22.4%) and - at the same time - decrease ($p < 0.05$) in the prevalence of cough (31.6%–19.6%15.4%–14.4%). Among children with diagnosed asthma during the 21 year span there was significantly ($p < 0.05$) increased proportion of treated children (51.3%-51.3%-69.5%–60.7%) and a lower frequency of presenting current symptoms.
Conclusions: Our findings are in line with the concept of a real increase in the occurrence of

* Corresponding author. Tel.: +48 32 252 37 34, +48 693 700 184, +4693 700 14.
E-mail addresses: gbrozek@sum.edu.pl (G. Brozek), josh.lawson@usask.ca (J. Lawson), dawid_szumilas@wp.eu (D. Szumilas), jzejda@sum.edu.pl (J. Zejda).

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asthma and allergic disease in children. The pattern involves not only physician-diagnosed allergic diseases but also occurrence of symptoms related to respiratory disorders. Diagnosed asthma is better treated and better controlled.

Introduction

Allergic diseases are very common, especially among children. Over the second half of the 20th century, the prevalence of allergic diseases, including asthma, increased significantly worldwide with the highest increase observed in industrialized nations [1—3]. Currently, the frequency of allergic diseases varies geographically globally with different temporal patterns in the same populations. The best documented epidemiology of allergic disease is childhood asthma. Actual data shows significant differences in childhood asthma frequency between Europeans countries, ranging from 1.4% to 1.7% in Belarus [4] and Ukraine [5] through 7.7—9.6% in Sweden and Hungary and up to 21.6—29.7% in Ireland and the UK [2,6—8]. In addition, the direction of the time trends of asthma and its symptoms differ with evidence of decline in Belgium, Sweden, and the UK; plateaus in Spain; and increases in countries including Finland, Romania and Ukraine [2,9]. Similar differences are observed in case of atopic eczema and allergic conjunctivitis [3,9]. These results suggest that there is not a common pattern for asthma and allergic disease prevalence in Europe. Monitoring prevalence changes over time should be completed and interpreted in regional populations such as within individual countries. Such summarized data gives a better picture of the epidemiology of allergic diseases and is helpful not only in planning national health care needs but also to predict trends in the future.

In a previous study we found statistically significant increases in the prevalence of allergic diseases diagnosed by a physician and respiratory symptoms suggestive of asthma tendency. In 2014 we expanded on the previous study by repeating a cross-sectional study as has been completed before to further investigate changes in asthma prevalence, now up to 21 years making use of four time points. We further expand on the previous investigation of temporal trends by investigating changes in the management of asthma among children and profiling children with asthma with regard to report of respiratory symptoms and allergic conditions. More specifically, our objective was to determine whether increases in the prevalence of asthma and related conditions was continuing in this community and to identify if the profile of children with asthma changed between 1993 and 2014.

Methods

Study design and study population

This study consisted of four repeated cross-sectional surveys in the same location and using the same survey with identical methodology. This protocol has been described previously as part of our earlier investigation of the temporal trends in asthma prevalence [10,11]. In brief, this study was completed in Chorzow, Poland in 1993, 2002, 2007, and 2014. Chorzow is an industrial center, part of the Silesian Agglomeration in the Upper Silesian Industrial Zone with coal mining and metallurgical operations. Over the 21 years of study, Chorzow's population ranged between 127,049 and 111,168 [12]. No major changes in the population structure occurred during the study period [12]. For example, the proportion of children 14 years and younger ranged between 16.6% in 1995 to 14.5% in 2013 with no noticeable migration [12]. In Chorzow, as well as in the whole Silesia region there was observed significant reduction of air pollution [14].

Schools were randomly selected for inclusion to the study in 1993. In subsequent survey years, the same schools were included in order to remove any bias that may occur by resampling schools. All children between 7 and 10 years of age attending selected schools were eligible for inclusion. A study package, which included a letter explaining the study objectives, a written consent form, and a survey were sent home through the schools for self-completion by the parent or guardian. Once completed, the survey was returned to the school where it was picked up study staff.

Study instrument and operational definitions

The same study instrument was used in each round of data collection. This was a 17 item survey asking about age, sex, doctor's diagnosis of asthma, respiratory symptoms, and allergic disorders. The survey was based on the Polish version [15] of a validated children's lung health questionnaire [16] that was also used in the Central European Study of Air Pollution and Respiratory Health [17].

The list of diagnosed allergic disorders was based on self-report and included asthma, obstructive bronchitis, allergic rhinitis, allergic conjunctivitis, atopic dermatitis, pollen-, dust- and food-allergy each asking about a previous physician diagnosis ever in the past. Asthma and other diagnoses of allergic diseases/disorders were defined according to the answer to the question "Has a child ever had [*given disease*] diagnosed by physician?". In addition to this, information about the age of diagnosis and current treatment was ascertained for a report of an asthma diagnosis or an obstructive bronchitis diagnosis.

Chest wheezing (ever) was defined according to the answer to the question: "Has a child ever had wheezing or whistling in the chest at any time in the past?". Current chest wheezing was defined according to the answer to the question: "Has a child's chest sounded wheezy or whistling in the last 12 months?". Attacks of dyspnea (ever) were