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The underdiagnosis and undertreatment of asthma — a general population study of the inhabitants of the Lodz Province in Poland

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Abstract

Introduction: Hundreds of studies investigating the epidemiology of asthma in various populations have been conducted in the past 30 years, yielding a large body of interesting data, including data on prevalence and risk factors. Less information is, however, available on the accurate diagnosis of asthma and its correct treatment. Epidemiological studies of the prevalence of asthma in the general population was conducted between 1998 and 2000 in the Lodz Province in Poland. The present analysis is an evaluation of the detectability and treatment of this disease.

Material and methods: The study group consisted of 1522 randomly selected residents of the Lodz Province aged 3 to 80 years. The demographics and medical history were collected using standardised questionnaires. All the respondents underwent skin prick tests and screening spirometry. Additional diagnostic tests were performed in doubtful cases.

Results: Complete data collected from 1340 subjects (1057 adults and 283 children) were included in the analysis. The prevalence of asthma was calculated at 7.3% in adults and 8.5% in children. The accurate diagnosis of asthma had not been made in 71% of symptomatic children and 49% of the adults. Forty-eight percent of adult asthmatics had not used any antiasthmatic medication in the previous 12 months. Subjects suffering from asthma had most commonly used the following drugs in the previous 12 months: β_2 -agonists (46.8%), anticholinergics (13%), inhalation glucocorticoids (36.4%), oral glucocorticoids (16.9%), parenteral glucocorticoids (3.9%), xanthine derivatives (33.8%) and cromones (11.7%).

Conclusions: The results of this study reveal shortcomings in the healthcare system which require appropriate actions aimed at early diagnosis and improvement of allergy treatment before the patient's health deteriorates irreversibly.

Key words: epidemiology of asthma, asthma underdiagnosis, asthma undertreatment

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Introduction

The past 30 years have seen a rapid rise in the incidence of asthma [1, 2]. The numerous epidemiological studies conducted in various populations provide interesting data on the epidemiology of this disease, specifying the prevalence rates [3] and identifying the risk factors [4]. Less information is available on the accurate diagnosis of asthma and its correct treatment. It is commonly recognised that

early diagnosis, patient education and optimal treatment are the main weapon in the fight with asthma [5]. Several recent studies have shown that fewer than a half of patients with asthma have an accurate diagnosis [6–8], fewer than 50% of patients receive antiasthmatic drugs [9] with less than 30% of which being anti-inflammatory drugs [4, 10]. These studies demonstrate that the underdiagnosis and undertreatment of asthma continues to be a significant public health problem in Europe.

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A nationwide, multicentre study investigating the prevalence of allergic diseases was conducted in Poland between 1998 and 2000 with Lodz being one of the participating sites [11].

The aim of the present analysis is to evaluate the detectability and treatment of asthma in the general population of the Lodz Province in Poland.

Material and methods

Study population

At the end of 1998 the area of the Lodz Province was 1,520 km² and its population was 1,105,400. The study was conducted on a random sample of 1,522 individuals of both sexes from 3 to 80 years of age inhabiting various regions of the province: the city centre of Lodz, the suburbs and the rural areas.

The random selection involved three steps. In the first step, three target regions were randomly selected from the pool of prespecified regions that differed from one another in terms of air pollution and urbanisation. In the second step, the Provincial Statistical Office randomly selected 600 addresses (200 addresses per target region). In the third step, the Field Data Bank drew up a list of persons who were official residents at these addresses.

Interview

Subjects were interviewed at their homes by specially trained staff recruited among medical students and nurses. The information about the study had been published in the local press and each of the randomly selected families received an invitation letter by post. The interviewers set the date of the visit in advance with each of the randomly selected persons. Three attempts at contacting the subjects and conducting the interview at each of the randomly selected addresses were made.

Questionnaires

Demographic data and medical history were collected using standardised questionnaires especially developed for the purpose of the study. Five questionnaires had been developed: a living conditions questionnaire, a screening questionnaire (to be completed by all the subjects), a detailed questionnaire for adults (to be completed only by those subjects who had given a positive answer to any of the questions in the screening questionnaire), a questionnaire for children and a questionnaire for unexamined subjects (including absentees and subjects refusing to participate in the study). The questions about asthma and allergy were based on the questionnaires developed by the International Study of Asthma and Allergies in Chil-

hood (ISAAC) and the European Community Respiratory Health Survey (ECRHS). They were related to the symptoms of asthma and allergy, smoking, heart disease, potential risk factors for allergic diseases and asthma, previously diagnosed diseases, elements of differential diagnosis and previous treatment.

Skin prick tests

All the subjects underwent skin prick testing with a panel of 10 ubiquitous allergens: *Dermatophagoides farinae*, *Dermatophagoides pteronyssinus*, grass pollen mix, *Artemisia* pollen, rye pollen, birch pollen, hazel pollen, feline allergens, *Alternaria* and *Cladosporium* spores (Allergopharma). The tests were applied on the inner aspect of the forearm using specially adapted disposable lancets (Allergopharma). The results of the tests were based on the wheal diameter and were read after 10 minutes for the positive and negative controls (histamine and diluent) and after 15 minutes the allergens. Appropriate washout periods were observed for drugs that might affect the test results. A positive test reaction was defined as a wheal 4 mm greater in diameter than the negative control reaction.

Screening spirometry

During the same visit all the adult subjects underwent screening spirometry using a microspirometer (MicroMedical Ltd Rochester) in accordance with the commonly accepted ATS guidelines [12]. Spirometry was performed in the sitting position with nose clips on. At least three manoeuvres were carried out but if the results were not reproducible up to 8 attempts were made. Four parameters were recorded: FEV₁, FVC, FEV₁/FVC and PEF. FEV₁ and FVC values below 80% predicted and FEV₁/FVC below 70% predicted were considered abnormal.

Diagnosis of asthma

The diagnosis was established at the clinical site by one of the specialists based on the questionnaire, skin prick test results and spirometry results in accordance with the ATS recommendations [13]. In doubtful cases, before the final diagnosis was established, the subjects underwent additional tests and assessments at the site, such as the reversibility test, histamine challenge, exercise test, assessment of the total and specific IgE.

Statistical analysis

Descriptive statistics were used to characterise the study population. The incidence of asthma along with 95% confidence intervals were calcu-

Table 1. Demographic data

	Adults	Children
Number of sample	1057	283
Sex		
Female	606 (57.3%)	151 (53.4%)
Male	451 (42.7%)	132 (46.6%)
Range of age	17–80 years	3–16 years
Mean of age	44.58 years	8.93 years
Place of living		
City-centre	395	87
Suburbs	327	62
Rural area	335	134

lated for adults and children separately. Subgroup comparisons were conducted using the chi-square test and Fisher's exact test. Differences were considered significant at $p < 0.05$. The degree of underdiagnosis was defined as the percentage of subjects with newly diagnosed asthma in the population of individuals with asthma. The degree of overdiagnosis was defined as the percentage of subjects incorrectly diagnosed with asthma (percentage of subjects without asthma) in the population of healthy individuals. The use of antiasthmatic medication in the group of subjects suffering from asthma was expressed as percentages.

Results

Demographic characteristics

A total of 1522 inhabitants of the Lodz Province were randomly selected for the study and 1351 were studied. Complete data sets from 1340 subjects (1057 adults and 283 children) were included in the statistical analysis (Table 1). The study participation ratio was high (88%).

The mean age of the adults participating in the study (defined as subjects between 16 and 80 years of age) was 44.58 years and that of the children (defined as subjects between 3 and 16 years of age) was 8.93 years. Women accounted for 57.3% of the study population of adults and girls for 53.4% of the study population of children.

The study group was representative for the population of the Lodz Province in terms of age and sex. For both variables in the study group very high values of similarity for the structure of the general population were obtained: for sex 97.6% and for age 90.8%.

Questionnaires

Wheezing was reported by 17.3% of the adult subjects with 10.7% having experienced it in the

past 12 months and 12.3% having developed wheezing irrespective of infection. Nocturnal dyspnoea was reported by 7.2% of the adult subjects with 4.6% having experienced it in the past 12 months. Nocturnal cough was reported by 17.9% of the adult subjects with 10.5% having experienced it in the past 12 months. Asthma attacks were reported by 3.3% of the adult subjects with 1.6% having experienced them in the past 12 months (Table 2). A history of antiasthmatic medication use was provided by 4.3% of the subjects. Wheezing and dyspnoea were significantly more commonly reported by the inhabitants of the city centre of Lodz.

In the study group of children 15.9% had a history of wheezing, 8.5% had a history of wheezing in the past 12 months, 4.2% had a history of exercise-induced wheezing and 4.2% had a history of wheezing unrelated to infection. Dyspnoea with wheezing occurred in 8.8% of the children with 4.6% having experienced these symptoms in the past year. In 3.5% of the children these symptoms were related to exercise and in 2.8% they were unrelated to infection. Dry nocturnal cough was reported in 10.2% of the children with 4.6% of the children having experienced it in the past year. A history of previous treatment for spastic bronchitis was elicited in 8.5% of the children (Table 2). The differences in the incidence of the symptoms of asthma between the children inhabiting urban and those inhabiting rural areas did not reach statistical significance.

Diagnosis of asthma

A total of 3.7% of the adults and 2.5% of the children had been previously diagnosed with asthma by their primary care physicians or specialists. Asthma was most commonly diagnosed in the city centre with 6.3% of the adults and 3.5% of the children having been diagnosed (Table 3). Based on the questionnaires, additional assessments and the expert evaluation the prevalence of asthma in the study population was estimated at 7.3% (95% CI: 5.7–8.9) in the adults and 8.5% (95% CI: 5.2–11.7) in the children (Table 3).

Statistically significant differences in the prevalence of asthma were observed between the city centre and the rural areas. The diagnosis of asthma had been made in 13.2% (95% CI: 9.8–16.5) of the adult inhabiting the city centre and in 4.2% (95% CI: 2.0–6.3) of the adult inhabiting the rural areas ($p < 0.0001$). Asthma was diagnosed in 18.4% (95% CI: 10.3–26.5) of children inhabiting the city centre and in 6% (95% CI: 2.0–10.0) of children inhabiting the rural areas ($p < 0.0001$) (Fig. 1).

Table 2. Data from interview

Adults	Questionnaire		Children	(%)
	(%)			
Wheezing	17.3	Wheezing		15.9
Wheezing during last 12 months	10.7	Wheezing during last 12 months		8.5
Wheezing independently of infection	12.3	Wheezing after exercise		4.2
Night dyspnoe	7.2	Wheezing independently of infection		4.2
Night dyspnoe during last 12 months	4.6	Dyspnoe with wheezing		8.8
Night cough	17.9	Dyspnoe during last 12 months		4.6
Night cough during last 12 months	10.5	Dyspnoe provoked by exercise		3.2
Asthma attacks	3.3	Dyspnoe independently of infection		2.8
Asthma attacks during last 12 months	1.6	Dry night cough		10.2
		Dry night cough during last 12 months		4.6
		History of spastic bronchitis		8.5

Table 3. Asthma diagnosis

	Adults	Children
Previously diagnosed asthma	40 (3.7%)	7 (2.5%)
Epidemiological diagnosis of asthma	77 (7.3%)	24 (8.5%)
Asthma underdiagnosis	37 (49%)	17 (71%)

Cases of no diagnosis or incorrect diagnosis of asthma

A total of 71% of the children and 49% of the adults had not been diagnosed with asthma despite its presence (Table 3). In the group of adult subjects, no cases of overdiagnosis of asthma (diagnosis of asthma despite its absence) were observed with one such case being found in the group of children. The specificity of the diagnosis of asthma in the real-life setting in the study population was 100% for the adults and 99.6% for the children with the respective sensitivity values of 51% and 29%. No differences in the percentage of subjects without the diagnosis of asthma despite its presence were observed between the areas of residence (Fig. 2).

Treatment of asthma

A total of 48% of the adults with asthma had not been receiving any antiasthmatic medications in the past 12 months (Fig. 3).

Among the adults with asthma: 46.8% had used beta-agonists in the past year, 13% had used anticholinergics, 36.4% had used inhalation glucocorticosteroids, 16.9% had used oral glucocorticosteroids, 33.8% had used xanthine derivatives and 11.7% had used cromones (Fig. 4).

Antiasthmatics were used more commonly by the inhabitants of the city centre than by the inhabitants of other regions (7.1% of the general population of the city centre of Lodz, 2.1% of the population of a town near Lodz and 3.0% of the rural population) ($p = 0.027$). No statistically significant difference was observed in the percentage of asthma patients receiving drug treatment between the individual areas of residence.

Discussion

Asthma is considered one of the most common chronic diseases and its prevalence is continually growing. Despite the widespread interest in this disease asthma still remains an underappreciated issue.

Our results indicate that there are still many patients with asthma in Poland who have not been properly diagnosed and who are therefore not receiving appropriate treatment. The problem does not only concern Poland, as both the underdiagnosis and undertreatment of asthma is a phenomenon observed in many other countries. The publications addressing the issue are scarce and do not reflect the real extent of the problem. Our study is the first study describing the epidemiological situation in Poland in terms of asthma detectability and its treatment.

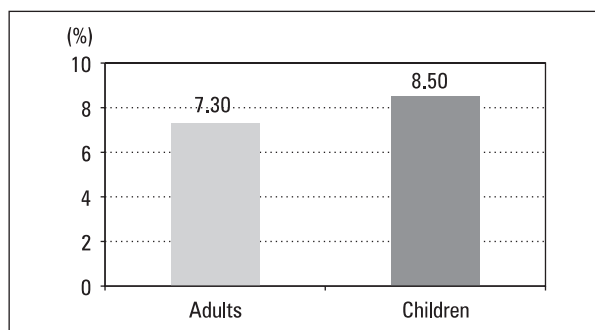


Figure 1. Prevalence of asthma in general population in Łódź province

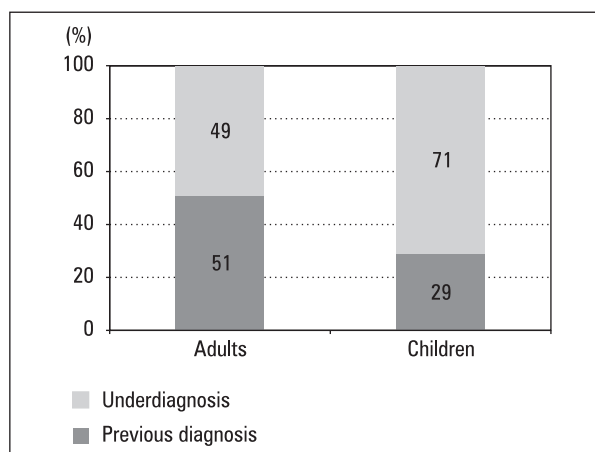


Figure 2. Asthma diagnosis rate

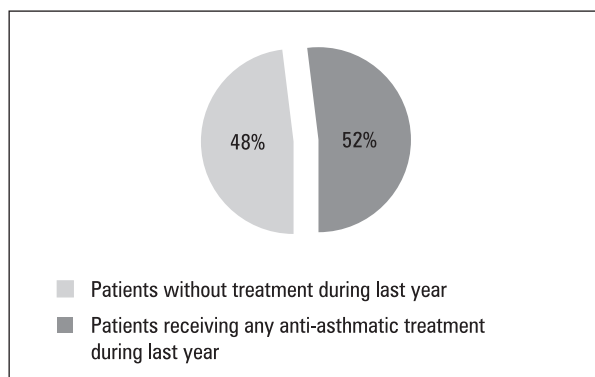


Figure 3. Asthma treatment rate

The study has been conducted in a representative group of inhabitants of the Lodz Province. All the epidemiological diagnoses have been verified by a specialist in accordance with the ATS criteria. The prevalence of asthma in the study group was 7.3% among the adults and 8.5% among the children. These findings are comparable with the prevalence rates in other European countries, such as Portugal, France, Italy, Germany [1]. Only 3.7% of the adults and 2.5% of the children carried a diagnosis of asthma previously made by their

primary care physicians or specialists. It follows therefore that as much as 71% of the children and 49% of the adults with asthma had not been properly diagnosed before. In a study by Van Schayck [6] conducted in a general population of adults inhabiting the eastern regions of the Netherlands the prevalence of asthma symptoms paralleled by an obstructive spirometric pattern was 7%, while only 2% of the subjects carried a diagnosis of asthma. This shows that only 26% of asthmatics had been properly diagnosed. Nish and Schweitz [7] examined a group of American firemen. In the group of subjects with confirmed asthma during the study 45% already carried this diagnosis, 25% had been suspected of asthma and 30% had not been diagnosed with asthma before. In South Africa, Ehrlich et al. [8] conducted a study in schoolchildren in Cape Town and showed that only 53% of children suffering from asthma knew about their disease. Siersted et al. [14] from Denmark evaluated the degree of underdiagnosis of asthma in a group of schoolchildren from 12 to 15 years of age and demonstrated that a third of asthmatics had not been diagnosed with asthma before. Montnemery et al. [15] assessed the specificity and sensitivity of the diagnosis of asthma established by general practitioners. They showed that these doctors, while being effective in ruling out the diagnosis of asthma (specificity 99%), were less successful in identifying patients with asthma (sensitivity 59%), which resulted in underdiagnosis of the disease. A frequent cause of the lack of accurate diagnosis is incorrect interpretation of transient symptoms, their similarity to symptoms of infection and chronic bronchitis in smokers [16]. But part of the responsibility also rests with the patients. Patient-related factors include ignoring or hiding the symptoms, especially mild symptoms, which results in low numbers of presenting patients [6,14,16]. A limited access to specialists is another independent factor.

Our study was not powered to evaluate the causes of the low detectability but to merely estimate the extent of the problem.

The lack of accurate diagnosis leads to the lack of appropriate treatment. About 50% of symptomatic subjects in our study were not receiving any asthma medication. Only 36% of them used inhalation glucocorticosteroids and 47% used β -agonists. The more widespread use of antiasthmatics among the inhabitants of the city centre resulted from the higher prevalence of asthma and not from better healthcare.

Although treatment errors have been identified as a significant problem in the care for patients with asthma, the relevant data are still scarce. En-

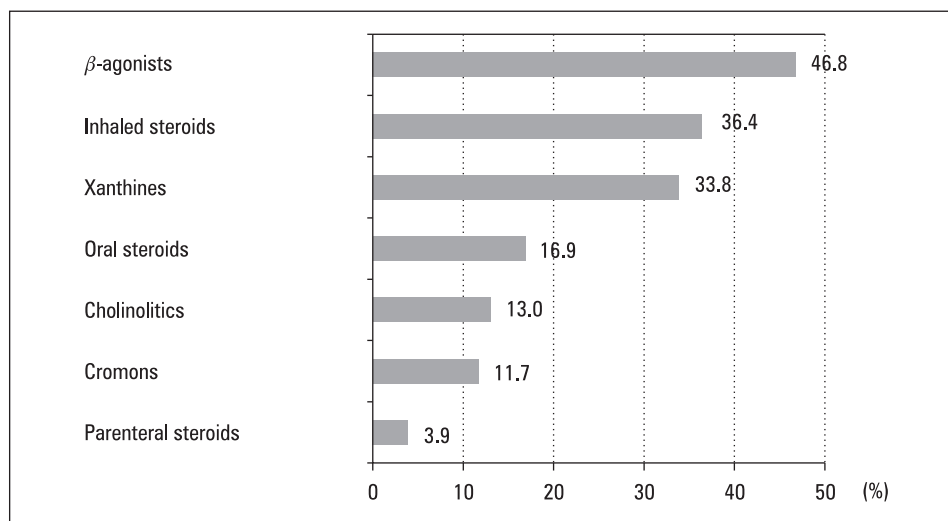


Figure 4. Pharmacotherapy used for asthma treatment in adults

right et al. [9] evaluated the treatment of asthma in elderly subjects. Among the subjects previously diagnosed with asthma 40% were using β -agonists, 30% inhalation glucocorticosteroids, 21% theophylline, 18% oral glucocorticosteroids and 39% were not using any medications. In a study by Bousquet et al. [10] in the general population of asthma patients 86.4% of the patients in Paris and 66.7% of the patients in Montpellier were not receiving any drug treatment. What is more, 85% of patients with severe asthma in Paris and 60% in Montpellier were not receiving any anti-inflammatory treatment. Bauman et al. [17] analysed the treatment of asthma in a random sample of schoolchildren from 5 to 12 years of age and found that only 20% of the children with wheezing and cough were receiving appropriate treatment. Ehlich et al. [8] showed that in the group of children with a diagnosis of asthma, 66.1% were receiving treatment when the study was being conducted (23.2% were receiving medication every day) versus 37% in the group without the diagnosis of asthma (with only 3% receiving medication every day). Salbutamol and theophylline syrup were the most commonly used treatments, while inhalation and anti-inflammatory agents were underutilised. Hill et al. [18] revealed that 70% of asthmatic children missing school for more than 10 days a year were not using any antiasthmatics or were only using β -agonists. Such patients run a high risk of acute exacerbations, absenteeism from work or school [18] due to asthma, hospitalisation [19, 20] or even sudden death [21, 22]. Gessner et al. demonstrated that the increased use of inhalation glucocorticosteroids leads to reduced risk of hospitalisation for asthma [23].

Conclusions

Our epidemiological study has shown that asthma is underdiagnosed in up to 71% of symptomatic children and as many as 48% of asthmatic adults are not using any asthma medication. Beta-agonists are the most commonly used class of antiasthmatics. This situation calls for changes in the organisation of healthcare, which should be directed at early diagnosis and optimal treatment aimed at preventing the irreversible deterioration of health.

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