

Epidemiology and direct costs of atopic dermatitis in Poland based on the National Health Fund register (2008–2017)

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Adv Dermatol Allergol 2019; XXXVI (6): 727–733

DOI: <https://doi.org/10.5114/ada.2018.79099>

Abstract

Introduction: Epidemiological data indicate significant differences in atopic dermatitis (AD) prevalence between countries.

Aim: The purpose of this study is to (i) analyse the recorded prevalence of atopic dermatitis (diagnoses of AD reported to the Polish National Health Fund (NHF)) and to (ii) estimate direct costs of medical care for AD incurred by the NHF.

Material and methods: The analysis was based on data reported to the database of the public payer (NHF). The prevalence rates were calculated using the NHF data and population estimates were obtained from the Central Statistical Office of Poland (GUS).

Results: In 2017, the annual prevalence rate of AD in the Polish population was 32.5 per 10,000 inhabitants (34.7/10,000 for women and 30.1/10,000 for men). The highest prevalence was observed in the youngest age groups (300/10,000 in children up to 4 years of age and 141/10,000 in 5–9-year-olds). The prevalence rate decreased with age and AD was the least prevalent in patients over 85 years of age (4/10,000). In 2008–2017, NHF expenditure on AD treatment varied between PLN 19.9 million (EUR 5.6 million) in 2008 and PLN 28.4 million (EUR 6.5 million) in 2016.

Conclusions: The prevalence rates of AD in Poland estimated on the basis of NHF data are significantly lower than those reported in previous epidemiological studies conducted in Poland and worldwide. This may indicate that the prevalence of AD in the Polish population is underestimated or that there are no adequate disease control measures in patients with a confirmed diagnosis.

Key words: atopic dermatitis, atopic eczema, epidemiology, direct costs.

Introduction

Atopic dermatitis (AD – ICD-10: L20; also called atopic eczema) is a chronic dermatosis characterized by inflammation of the skin, impaired epidermal barrier function and hypersensitivity to food and environmental allergens. The first signs and symptoms of AD usually occur in early childhood, but the disease may develop later in life [1, 2]. The most common clinical symptoms include inflammation, dry skin and itching [3]. Atopic dermatitis is characterized by a chronic and recurrent course. It is also associated with the presence of erythematous and

follicular skin lesions accompanied by lichenification (Thickening of the skin with clearly marked furrows and increased skin markings.), with secondary excoriations and erosions. Itching is very often a dominant and basic symptom of the disease. The typical location of the skin lesions depends of the patient's age [1, 2]. In children under the age of 2 years, lesions usually appear on the cheeks, scalp or forehead. In 3–11-year-olds, lesions are typically seen at sites of joint flexure (wrists, elbows and knee joints). Dorsal hand surfaces may also be affected in older children and adults. Atopic dermatitis may lead

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Received: 24.07.2018, **accepted:** 13.08.2018.

to the development of other allergic diseases, such as asthma or allergic rhinitis [4].

The etiopathogenesis of atopic dermatitis is multifactorial, including environmental and genetic factors [2, 4]. According to the results of numerous studies, the so-called “western lifestyle” associated with migration of the population or increasing urbanization promotes exposure to increasingly numerous new factors, including allergens, which may lead to the development and exacerbation of AD. It has not been clearly confirmed which environmental factors actually contribute to the development of the disease and which may act preventatively. Relevant publications provide various, mutually exclusive results, for example concerning diet, e.g. the duration of breastfeeding or timing of the introduction of solid food to the child’s diet. Another controversial issue is the place of residence (urban or rural) and exposure to domestic animals and livestock. On the one hand, it is considered that exposure to animals in early childhood reduces the risk of developing AD, but on the other hand, animals are a source of endotoxins, and exposure to microorganisms contributes to development of the disease. Factors influencing development of AD include air pollution (NO₂, CO), tobacco smoke, impaired function of the protective epidermal barrier, frequent and complex antibiotic therapy, exposure to allergens, obesity and lack of physical activity [3–5].

The incidence of AD has been increasing steadily and it is estimated that presently it afflicts over 30% of the population. The onset of symptoms is in the first year of life in approximately 50% of AD cases and before 5 years of age in almost 90% [1, 2]. Epidemiological data indicate differences in AD prevalence between countries. According to the International Study of Asthma and Allergies in Childhood – Phase One (ISAAC), among children aged 6–7 and 13–14 years, AD was the most prevalent in Australia, the United Kingdom and Scandinavia (20%) and the least prevalent in China (2%) [6, 7]. The European Community Respiratory Health Survey II (ECRHS II), conducted among 20–44-year-olds in 25 European centres and Portland in the United States, estimated the lowest prevalence rate in Switzerland (2.2%) and the highest rate in Estonia (17.6%) [8]. At present, the worldwide prevalence of AD is estimated at 15–20% among children and 1–3% in adults [9, 10]. Although AD is considered a childhood disease, in many cases it persists during the entire lifetime. Moreover, AD is increasingly often diagnosed among people over 60 years of age [11]. In Poland, according to the results of the ECAP (Epidemiology of Allergic Diseases in Poland) study, the mean prevalence of AD in the study population ($N = 4783$) was 6.5% (8.7% in 6–7-year-olds, 9.0% in 13–14-year-olds and 3.6% in adults) [12, 13]. The same study found that AD was diagnosed more often among women (OR = 1.52; 95% CI: 1.30–1.77), people living in big cities (OR = 2.23; 95% CI: 1.61–3.09), people with atopic mothers (OR = 2.07;

95% CI: 1.72–2.48), people with atopic fathers (OR = 2.00; 95% CI: 1.61–2.49), and people with higher education (OR = 1.61; 95% CI: 1.11–2.32) and higher socio-economic status (OR = 1.35; 95% CI: 1.04–1.74) [13]. The prevalence of AD based on data from the international literature is presented in Table 1 [12–21].

Aim

The purpose of this study is to analyse the recorded prevalence of AD (diagnoses of AD reported to the Polish National Health Fund (NHF)) and to estimate direct costs of medical care for AD in the public health system based on information from the NHF database.

Material and methods

The study used a method of desk research, namely, secondary statistical analysis of data reported to the National Health Fund in 2008–2017. This method has been successfully used previously in the analysis of NHF data for epidemiological purposes [22–25]. The National Health Fund is a public payer which has a single-payer status for all healthcare services financed from public funds in Poland.

The NHF databases contain the data of all patients in Poland who received healthcare services related to diagnosed AD, financed from public funds. For the purposes of the analysis, AD was defined by the relevant ICD-10 diagnosis codes: L20 – atopic dermatitis, L20.8 – other atopic dermatitis, and L20.9 – atopic dermatitis, unspecified. The healthcare services related to ICD-10 diagnosis code L20.0 (L20.0 – Besnier prurigo (prurigo gestationis of Besnier) is a unique rare disease of pregnant women (afflicting about 2% of pregnant women) with a different pathomechanism and course (it occurs only during pregnancy) were not included in the present analysis.

The NHF databases were accessed for information about each treated patient with the ICD-10 L20 codes (with specific subcodes) given as the principal diagnosis or a comorbidity in healthcare benefit settlement reports. A person with AD was defined as a patient with at least one healthcare service for AD recorded in the NHF database in a given calendar year. The data used in the analysis were anonymized in compliance with the Polish Act on the Protection of Personal Data.

The analysis of the costs was based on the expenditures reported to the NHF by healthcare service providers. The total cost of healthcare services related to AD and incurred by the public payer was calculated for each patient who had received such benefits (the total amount of costs of healthcare services related to this diagnosis). The total cost included the cost of the medical procedures rendered, but not patient-incurred cost of prescription drugs.

Table 1. The prevalence rates of AD according to available studies

Reference, year	Year of the study	Country	Study group	Prevalence	95% CI	Age of the subjects
Samoliński <i>et al.</i> 2014 Sybilski <i>et al.</i> 2015 [12, 13]	2006–2009	Poland	4,783	8.7% 9% 3.6%	No data	6–7-year-olds 13–14-year-olds 20–44-year-olds
Pekkarinen <i>et al.</i> 2007 [14]	2003	Finland Russia	344 children 344 mothers 427 children 284 mothers*	91/344 (26.5%)** 64/344 (18.6%) 17/427 (4.0%) 9/284 (3.2%)	No data	Schoolchildren, aged 6–16 years, and their mothers
Priftanji <i>et al.</i> 2001 [15]	No data	Albania UK	1,114 1,346	15% 17.8%	0.8 (0.6–1.1) 95% CI	9–11-year-olds
Björkstén <i>et al.</i> 1998 [16]	No data	Scandinavia and Eastern Europe	79,000	1.5–35.7% 1.3–48.8%	No data	6–7-year-olds 13–14-year-olds
Engebretsen <i>et al.</i> 2017 [17]	1996–2002	Denmark	52,950	15.0%	No data	Birth cohort: 6 and 18 months
Shaw <i>et al.</i> 2011 [18]	2003	USA	102,353	10.7%	No data	≤ 17 years
Radtke <i>et al.</i> 2017 [19]	2009	Germany	1,349,671	3.67%	No data	≥ 18 years
Bergmann <i>et al.</i> 2016 [20]	2008–2011 2003–2006	Germany	7,988 17,641	3.5% 13.2%	No data	18–79-year-olds 0–17-year-olds
Barbarot <i>et al.</i> 2018 [21]	2016	United States, Canada, France, Germany, Italy, Spain, United Kingdom, Japan	90,658	2.1–4.9%	No data	18–65-year-olds

Source: Own work based on [12–21]. *The study was conducted among people living in Finnish and Russian Karelia. **Physician-diagnosed atopic eczema.

The prevalence rates in 2017 were calculated using the NHF data and the population estimates obtained from the Central Statistical Office of Poland (GUS) (as at 31.12.2017) (Ludność. Stan i struktura ludności oraz ruch naturalny w przekroju terytorialnym. Stan w dniu 31 XII 2017 r. <https://stat.gov.pl/obszary-tematyczne/ludnosc/ludnosc/ludnosc-stan-i-struktura-oraz-ruch-naturalny-w-przekroju-terytorialnym-w-2017-r-stan-w-dniu-31-xii-6,23.html> [20.06.2018]). For the purposes of this study, the AD prevalence rate was defined as the ratio of patients who received healthcare services for AD in outpatient or hospital settings to the total size of the population in a given region.

No ethics committee approval was required as the study was non-invasive and used data collected by a public institution.

Exchange rates were defined on the basis of data from the National Bank of Poland (NBP) (http://www.nbp.pl/home.aspx?f=/kursy/arch_a.html). Purchasing Power Parities (PPP) were based on data from the Organisation for Economic Co-operation and Development (OECD) (http://stats.oecd.org/Index.aspx?datasetcode=SNA_TABLE4).

Statistical analysis

Statistical analyses were performed using Excel, Statistica 10 and SAS EG 7.1 software. The analysis did not

include statistical significance tests and no confidence intervals were given since the NHF data refer to the entire Polish population.

Results

Epidemiology

In 2017, there were 259.4 thousand outpatient consultations for 120.4 thousand patients with a diagnosis of AD (an average of 2.4 consultations per person). By comparison, in 2008, there were 315.3 thousand consultations for 143.2 thousand patients (an average of 2.2 consultations per person). In 2017, there were altogether 7.7 thousand hospitalizations for AD in 7.0 thousand patients (an average of 1.1 hospitalizations per person). In 2008, there were 11.6 thousand hospitalizations for 9.1 thousand patients (an average of 1.3 hospitalizations per person). The detailed data concerning the number of patients treated in outpatient settings and hospital by diagnosis are presented in Figures 1 A and B.

Among patients receiving healthcare services for AD in 2017, women constituted 55.2%. In 2008–2017, this percentage varied between 54.1% and 55.3%. In 2017, 66.4% of patients with AD were people residing in urban areas.

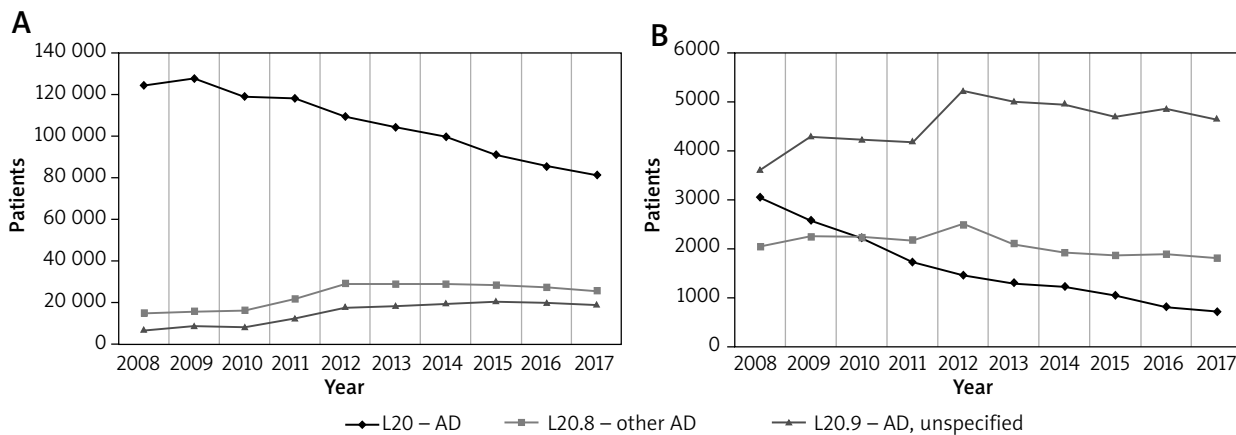


Figure 1. A – The number of patients treated in specialist outpatient care due to conditions with the ICD-10 diagnosis codes L20, L20.8 and L20.9 in 2008–2017. **B** – The number of patients hospitalized for conditions with the ICD-10 diagnosis codes L20, L20.8 and L20.9 in 2008–2017

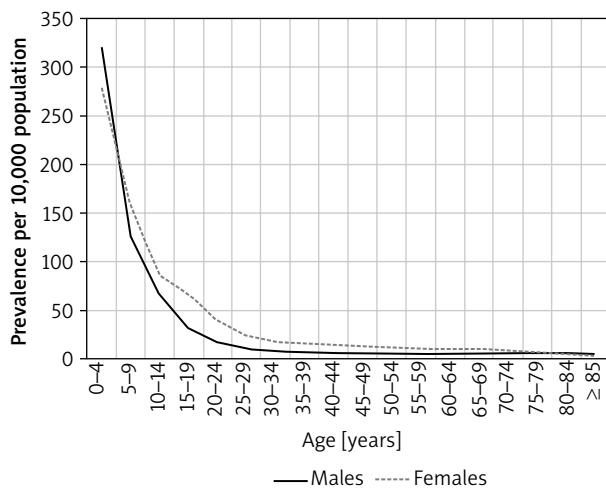


Figure 2. The prevalence of AD per 10,000 inhabitants by sex and age in 2017

In 2017, the prevalence rate of AD in the Polish population was 32.5 per 10,000 inhabitants (34.7/10,000 for women and 30.1/10,000 for men). The highest prevalence rates were found in Podlaskie Voivodeship (38.8/10,000) and Kujawsko-Pomorskie Voivodeship (38.8/10,000) and the lowest in Lubuskie Voivodeship (26.9/10,000) and Mazowieckie Voivodeship (27.2/10,000).

The highest prevalence was observed in the youngest age groups, in both girls and boys (300.4/10,000 in children up to 4 years of age and 141.3/10,000 in 5–9-year-olds). The prevalence rate decreased with age and AD was the least prevalent in patients over 85 years of age (3.6/10,000). The details are presented in Figure 2.

Direct costs

In 2017, the NHF spent PLN 26.5 million (EUR 6.2 million) on health care services for AD. This represented

a 6.6% decrease in expenditure in comparison with 2016 (the 2016 figure represented a 14.3% increase compared to the previous year). In 2008–2017, NHF expenditure on AD treatment varied between PLN 19.9 million (in 2008) and PLN 28.4 million (in 2016). After conversion into EUR (accounting for the annual exchange rate), the highest expenditure was in 2016 (EUR 6.5 million) and the lowest in 2011 (EUR 5.4 million). The detailed data are presented in Table 2.

In 2017, NHF expenditure varied considerably between voivodeships, partially due to differences in the number of inhabitants. The highest amount was allocated for this purpose in the Mazowieckie Voivodeship (PLN 2.9 million), and the lowest in Lubuskie, Opolskie and Świętokrzyskie Voivodeships (between PLN 0.5 and 0.6 million). In total, the costs of outpatient care for AD accounted for 52.9% of the total cost. This percentage differed considerably between individual voivodeships, from 69.7% in Świętokrzyskie Voivodeship to 21.4% in Warmińsko-Mazurskie Voivodeship. The highest expenditure per patient was recorded in Warmińsko-Mazurskie Voivodeship (PLN 394/person) and the lowest in Świętokrzyskie Voivodeship (PLN 155/person). Regarding the entire Polish population, mean annual NHF expenditure was PLN 0.69 per person. The lowest amount was recorded in Świętokrzyskie Voivodeship (PLN 0.47 per person) and the highest in Warmińsko-Mazurskie Voivodeship (PLN 1.25 per person). The detailed data are presented in Table 3.

Discussion

In the period of interest (2008-2017), the number of patients treated for AD (according to ICD-10 diagnosis codes: L20, L20.8 and L20.9) in public health care in Poland ranged from 131.5 to 162.2 thousand people annually. The incidence of AD has been steadily increas-

Table 2. The NHF expenditure on AD treatment in hospital and specialist outpatient care in 2008–2017

Parameter	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Hospital	9,358,450	10,877,493	10,140,054	9,806,248	11,885,012	11,295,922	10,949,232	10,648,217	13,969,996	12,504,860
SOC*	10,522,216	12,568,349	11,839,575	12,352,818	13,132,495	13,014,210	13,148,887	14,220,229	14,442,243	14,041,880
Total	19,880,666	23,445,842	21,979,629	22,159,066	25,017,507	24,310,132	24,098,119	24,868,446	28,412,239	26,546,740
Total (USD)	8,251,978	7,523,857	7,288,400	7,477,582	7,681,150	7,691,133	7,637,830	6,596,230	7,205,559	7,027,223
Total (EUR)	5,653,377	5,418,123	5,502,335	5,378,675	5,977,899	5,791,574	5,757,937	5,943,843	6,512,834	6,235,142
Total (PPP GDP**)	10,791,555	12,543,860	12,189,228	12,300,861	13,928,267	13,796,544	13,636,776	13,961,985	15,894,159	14,896,809

*Specialist outpatient care, **Purchasing Power Parities for GDP (USD 1).

Table 3. The NHF expenditure on AD treatment in hospital and specialist outpatient care in 2017 by voivodeship

Voivodeship	Hospital [PLN]	SOC [PLN]	Total [PLN]	Number of patients	Average per patient [PLN]	Average per inhabitant [PLN]
Dolnośląskie	820,387	1,187,134	2,007,522	10,763	187	0.69
Kujawsko-Pomorskie	703,504	789,616	1,493,121	8,087	185	0.72
Lubelskie	460,738	760,091	1,220,830	6,759	181	0.57
Lubuskie	240,618	289,615	530,232	2,735	194	0.52
Łódzkie	1,221,491	996,735	2,218,227	8,516	260	0.89
Małopolskie	1,233,613	1,302,478	2,536,091	11,180	227	0.75
Mazowieckie	1,388,809	1,519,072	2,907,881	14,616	199	0.54
Opolskie	201,623	380,512	582,134	3,387	172	0.59
Podkarpackie	1,117,981	834,139	1,952,120	7,579	258	0.92
Podlaskie	308,475	522,443	830,918	4,603	181	0.70
Pomorskie	919,749	581,445	1,501,194	6,895	218	0.65
Śląskie	883,321	1,465,901	2,349,221	14,394	163	0.52
Świętokrzyskie	176,982	406,317	583,299	3,768	155	0.47
Warmińsko-Mazurskie	1,411,898	383,758	1,795,656	4,563	394	1.25
Wielkopolskie	977,822	1,481,130	2,458,952	11,903	207	0.71
Zachodniopomorskie	439,951	611,011	1,050,96	5,088	207	0.62

ing in Poland and worldwide as documented by the numerous epidemiological studies included [3–21]. The observed increase in AD prevalence may be associated with improved diagnostic accuracy. The diagnosis of AD in clinical practice should be based on internationally recognized diagnostic criteria, which include the clinical characteristics of skin lesions, historical data and selected laboratory parameters [26]. Atopic disease might sometimes be overdiagnosed given that there are many other skin diseases with similar clinical features. This is especially true for children and for clinical cases in which lesions are relatively small [26].

The rates calculated in this study seem to be underestimated when compared to the prevalence estimates

reported in the studies quoted. According to our estimates based on NHF data, recorded prevalence of AD accounts for 0.32% (32/10,000) in the Polish population. In the present study, the estimated prevalence rates were as follows: 1.41% (141/10,000) in 5–9-year-olds, 0.75% (75/10,000) in 10–14-year-olds and 0.15% (15/10,000) among young adults (20–44 years of age). The discrepancy between our results and data from earlier studies may be due, among others, to the specific research methodology and scope of the present analysis. The present study is based on official data (NHF) collected for the whole country. However, it should be noted that access to specialists (including allergists and dermatologists) is limited in Poland. Some patients may use private healthcare or

self-treat and, as a result, the calculated prevalence rates may be underestimated.

According to the present analysis, AD prevalence was slightly higher among women than men (34.7 vs. 30.1/10,000; OR = 1.15). The results are consistent with estimates from the ECAP study [12], in which women were more often diagnosed with AD (OR = 1.52; 95% CI: 1.30–1.77). Research from other European countries confirms this relationship. Among teenagers, AD was more common in girls in countries such as Germany [27], Spain [28] and Italy [29]. In adults, a similar correlation was also observed in the study of Harrop *et al.* (covering 25 European countries and Portland, USA) [8].

According to our estimates, the highest prevalence was observed in the youngest age groups and similar results have been presented in other studies [12, 13, 18, 30]. The present analysis demonstrated substantial variations in the prevalence of AD between voivodeships. In men, the prevalence rate per 10,000 population varied between 24.7 and 36.2, and in women between 28.4 and 42.4, depending on the geographical region. The epidemiological data from the literature demonstrated considerable differences in the prevalence of AD both between countries and between geographical regions in a given country [8, 14, 15].

The present analysis demonstrated an increase in the costs incurred by the public payer for treatment of AD (although fluctuation is present). The estimates of direct costs of AD available in the literature vary. It is impossible to compare them with the present study due to methodological differences (mostly questionnaire-based surveys rather than publications based on official data).

The analysis was based on the data available from the NHF. The NHF database was established for accounting purposes rather than to support research (such as epidemiological studies). The NHF register does not include information on private healthcare services. As a result, the calculated prevalence rates may be underestimated (a person with AD was defined as any patient who in a given year received a healthcare service related to the diagnosis, either as the principal disorder or comorbidity). On the other hand, not every patient with an initial suspicion of AD was ultimately diagnosed with this disease. This may result in overestimating the prevalence rates.

The analysis is based on official data covering the entire country (the entire Polish population). The present study analyses the information for 2008–2017, i.e. 10 reporting periods. In each reporting period, data were collected in the same manner, thus ensuring a high level of standardisation and comparability of the results.

Conclusions

The estimated prevalence rates of AD in Poland based on NHF data are significantly lower than those reported in previous epidemiological studies conducted in

Poland and worldwide. This may indicate that the prevalence of AD in the Polish population is underestimated or there are no adequate disease control measures in patients with a confirmed diagnosis. Some patients are treated in primary or private health care facilities. Further studies are required to confirm this hypothesis. The direct costs incurred by the NHF in relation to AD increased steadily in the years 2008–2017 while the number of provided services decreased.

Conflict of interest

The authors declare no conflict of interest.

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