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Is the ebb of asthma due to the decline of allergic asthma? A prospective consultation-based study by the Swiss Sentinel Surveillance Network, 1999–2005

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Objective. There are conflicting views on time trends of asthma and atopy during the last 10–15 years. Additional confusion is caused by the term of asthma which is a unifying name for different phenotypes. Asthma has been a topic for investigation to the Swiss Sentinel Surveillance Network (SSSN) since 1989. The objective of the actual study was to determine the influence of the allergic and non-allergic components of asthma on time trends from 1999 to 2005.

Methods. Primary care physicians participating in the SSSN were guided by diagnostic criteria for asthma. Rates of asthma episodes per 1000 consultations were calculated for all, for first and subsequent asthma episodes and for allergic and non-allergic asthma. Allergic asthma was defined as asthmatic manifestations in conjunction with eczema and/or hay fever. The smoothed time trend and its 95% confidence intervals were determined using generalized additive models with a loess smoother adjusting for seasonality.

Results. Consultations for allergic asthma have decreased between 1999 and 2005. Looking at different age groups, asthma associated with hay fever was reported with decreasing frequency in all age groups, whereas when associated with eczema, the other used marker of allergic asthma, slightly increased among young children.

Conclusions. The decrease of consultations for asthma is most probably due to the allergic component of asthma. Diagnostic shift over time and ready available medications probably contributed to this phenomenon. Our findings indicate a real decline of allergic asthma.

Practice recommendations. Consultations for asthma have decreased over recent years. The decrease of consultations for asthma is most probably due to the allergic component of asthma. Diagnostic shift over time and available medications probably contributed to this phenomenon. Strength of Recommendation Taxonomy (SORT) rating: strength of recommendation = C, level of evidence = 3.

Keywords. Allergic asthma, non-allergic asthma, time trends, primary health care.

Introduction

A broad consensus exists that the prevalence of asthma has increased during the 1970s and 1980s,[1] as well as that of other atopic diseases such as allergic rhinitis and eczema.[2,3] However, there are conflicting views on time trends of asthma and atopy during the last 10–15 years. Different methods of epidemiological investigation, regional characteristics and health care have been brought forward to explain this discrepancy.

Results from the International Study of Asthma and Allergies in Childhood (ISAAC) have shown not only a rise in prevalence of asthma, allergic rhinoconjunctivitis and eczema symptoms in many centres but also the absence of increases in prevalence of asthma symptoms for centres with existing high prevalence in the older age group.[4] Additional confusion is caused by the term 'asthma'. Asthma encompasses a disparate group of disorders which produce variable airflow obstruction, a more recent concept that has been disregarded in most studies.[5]

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Asthma has been a topic for investigation by the Swiss Sentinel Surveillance Network (SSSN) since 1989. The seasonal patterns of asthma have been described[6,7] and practice incidence has been studied.[8] Additional information on consultations for allergic and non-allergic asthma on the basis of the association of asthma with eczema and hay fever has been gathered since 1999.

The objective of this work was to explore which phenotype of asthma, allergic or non-allergic, contributed to the decline of consultations for asthma in primary care practices in Switzerland. Allergic asthma was defined as asthma associated with hay fever and/or eczema.

Methods

The Swiss Sentinel Surveillance Network

The SSSN, a monitoring system for infectious diseases and health problems which are important and/or frequent in primary health care, has been operating since 1986.[9] Sampling of participating physicians is based on stratification by geographic area, socio-demographic characteristics and their speciality.[10] Primary care in Switzerland is delivered mainly by GPs, general internists and paediatricians, a proportion of whom participate voluntarily in the SSSN. Based on the adjusted total number of consultations and home visits, the participants cover more than 3% of all consultations and count for about 3% of primary care physicians in the country. To ensure consistency, this study included data from 90% of the reporting physicians who reported $\geqslant$75% of the time. The Swiss Health Care System is non-centralized and patients are free to attend a doctor of their choice except if in managed care.

Asthma

The definition of asthma in the SSSN includes exertional, allergic and infectious causes: bronchial obstruction or hyperresponsiveness diagnosed by the presence of wheezing, dyspnoea or cough during or after physical exertion or on contact with pollen, dust or animal dander and cough at night without an acute respiratory infection or for more than 2 weeks after an acute respiratory infection.[11] Allergic asthma episodes were defined as episodes in patients suffering from eczema and/or hay fever.[12]

The number of first and subsequent consultations for asthma and its association with eczema and/or hay fever has been recorded since 1999 in order to discern allergic from non-allergic asthma. Patients' age and sex were also recorded.

Statistical analysis

Monthly and yearly rates of episodes per 1000 consultations were calculated from weekly reports for the period 1999–2005. Annual rates were determined for first and subsequent asthma episodes, for allergic and non-allergic asthma and for the respective subgroups of allergic asthma. Comparisons of annual mean rates were performed using the Mann–Whitney U test. The average trend of the number of asthma consultations was computed using generalized linear models with an approximated Poisson distribution (binomial distribution from a large sample of consultations and a small probability of asthma episodes). These regression models contained a linear (and when relevant, a quadratic) trend variable accounting for secular trends in consultation rates and a season variable to control for repeatable fluctuations over time. The SAS software[13] was used for the calculation of rates and regression models. The change of rates with time is represented graphically. First, the observed rates and then the smoothed long-term time trend are plotted. The smoothed time trend and its 95% confidence interval (CI) were determined using generalized additive models with a loess smoother adjusting for seasonality and a smoothing span of 0.67. These models were calculated using S-PLUS.[14] Smoothing is a data analysis technique for making the general shape of a time series apparent.

Results

Table 1 summarizes the relation between participants in the SSSN and consultations for asthma. The mix of primary care physicians was quite stable, averaging 58.5% (range: 56.3–59.8) for GPs, 27.4% (range: 25.8–28.6) for general internists and 14.1% (range: 12.1–16.3) for paediatricians. The age distribution among patients did not change over time (data not shown). Consultation rates for all, for first and subsequent episodes of asthma decreased between 1999 and 2005 with the strongest decline in earlier years.

Figure 1(a) shows the change of asthma phenotype episodes per 1000 consultations with time. The rate of allergic asthma showed a decrease of 0.15% per week ($P = 0.0140$), i.e. 7.5% per year. The decrease in rate of non-allergic asthma (0.08% per week or 4.1% per year) was statistically non-significant ($P = 0.1188$). Peaks for allergic and non-allergic asthma occur at entirely different periods of a year. To determine if a distinction between allergic and non-allergic asthma is recognizable in routine recording, the trend in rates was examined only during a typical hay fever season (May to August). The rate of allergic asthma episodes decreased 9.1% per year ($P = 0.0477$) and that for non-allergic asthma 2.2% per year ($P = 0.6693$). All trends were linear. Figure 1(b) focuses on time trends of allergic and non-allergic asthma among 0- to 16-year-old children per 1000 paediatric consultations. Trends are similar to those in Figure 1(a).

Figure 2 shows, for different age groups, the curves for eczema-related and hay fever-related

TABLE 1 *Participants and consultations for asthma in the SSSN, 1999—2005*[a]

	1999	2000	2001	2002	2003	2004	2005
Total SSSN participants[b]							
n	231	240	224	223	224	217	194
% of all primary care physicians in Switzerland	3.0	3.1	3.0	3.4	3.0	2.9	2.6
GPs							
n	130	139	134	132	134	125	115
%	56.3	57.9	59.8	59.2	59.8	57.6	59.3
General internists							
n	66	62	60	60	63	62	52
%	28.6	25.8	26.8	26.9	28.1	28.6	26.8
Paediatricians							
n	35	39	30	31	27	30	27
%	15.2	16.3	13.4	13.9	12.1	13.8	13.9
Total SSSN consultations[c]							
n	1 060 644	1 129 277	1 022 771	986 958	991 816	948 105	843 172
% of all primary care consultations in Switzerland	4.0	4.2	3.9	3.8	3.9	3.6	3.1
Consultations for asthma							
n	2336	2346	1720	1632	1549	1604	1324
Rate per 1000 consultations	2.20	2.08	1.68	1.65	1.56	1.69	1.59
First asthma episodes							
n	818	845	601	671	556	576	468
Rate per 1000 consultations	0.77	0.75	0.59	0.68	0.56	0.61	0.56
Subsequent asthma episodes							
n	1518	1501	1119	961	993	1028	874
Rate per 1000 consultations	1.43	1.32	1.09	0.97	1.00	1.08	1.04
Hay fever-related asthma							
n	1030	962	610	486	595	531	404
Rate per 1000 consultations	0.98	0.85	0.60	0.49	0.56	0.56	0.48
Eczema-related asthma							
n	241	267	231	192	208	178	162
Rate per 1000 consultations	0.23	0.24	0.23	0.19	0.21	0.19	0.19
Allergic asthma consultations (hay fever and/or eczema related)							
n	1035	962	707	581	676	632	500
Rate per 1000 consultations	0.98	0.85	0.69	0.59	0.68	0.67	0.59
Non-allergic asthma consult							
n	1310	1392	1013	1051	873	972	842
Rate per 1000 consultations	1.23	1.23	0.99	1.06	0.88	1.03	1.00

[a]Some of the counts and rates from 1999 to 2001 were reported in ref. 8.
[b]Eligible for evaluation, i.e. reporting for at least 39 weeks per year.
[c]Based on the data pool by santésuisse, the state subsidized insurance company from all sickness funds.

asthma consultations. Hay fever (30–44%) was reported more often in conjunction with asthma than eczema (10–13%). Asthma in children 0–4 years of age suffering from eczema showed an average increase of 9.4% per year from a mean of 142 episodes per 1000 asthma episodes (95% CI: 103–181) in 1999 to 238 episodes per 1000 asthma episodes (95% CI: 154–322) in 2005, $P = 0.0939$ (Mann–Whitney *U*-test). Asthma in patients suffering from hay fever showed a decrease in all age groups. In 0–4 years old, the decrease was 24.4% per year from 255 (95% CI: 175–335) to 96 (95% CI: 38–155), $P = 0.0045$, in 5–16 years old 4.7% per year from 556 (95% CI: 471–640) to 433 (95% CI: 302–565), $P = 0.1020$ and in all ages together 6.2% per year from 400 (95% CI: 359–442) to 263 (95% CI: 220–306), $P = <0.0001$, between 1999 and 2005. The average rates above were calculated using a linear and quadratic term for time.

First and subsequent asthma consultations showed similar size effects for the change of both asthma phenotypes with time.

Discussion

The consultations for asthma have decreased over time mainly due to a decrease of allergic asthma. Consultations for non-allergic asthma did not change significantly between 1999 and 2005. Whereas eczema associated with asthma seems to have slightly increased over recent years among young children, hay fever associated with asthma was reported with decreasing frequency from 1999 to 2005 in all age groups.

Limitations

Our findings have to be interpreted in light of several characteristics of the SSSN. First, the incidence/

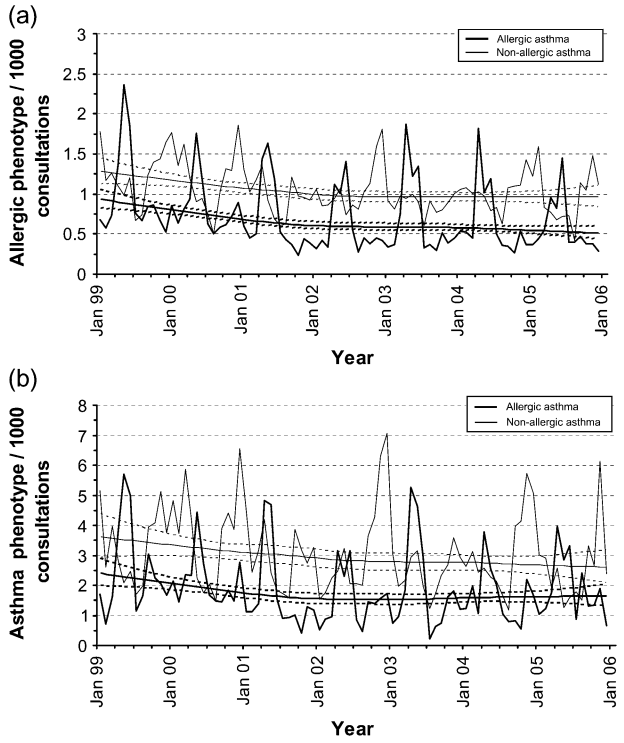

FIGURE 1 *Long-term trends of allergic and non-allergic asthma: (a) episodes per 1000 consultations in all age group and (b) episodes per 1000 consultations by paediatricians in 0–16 years old*

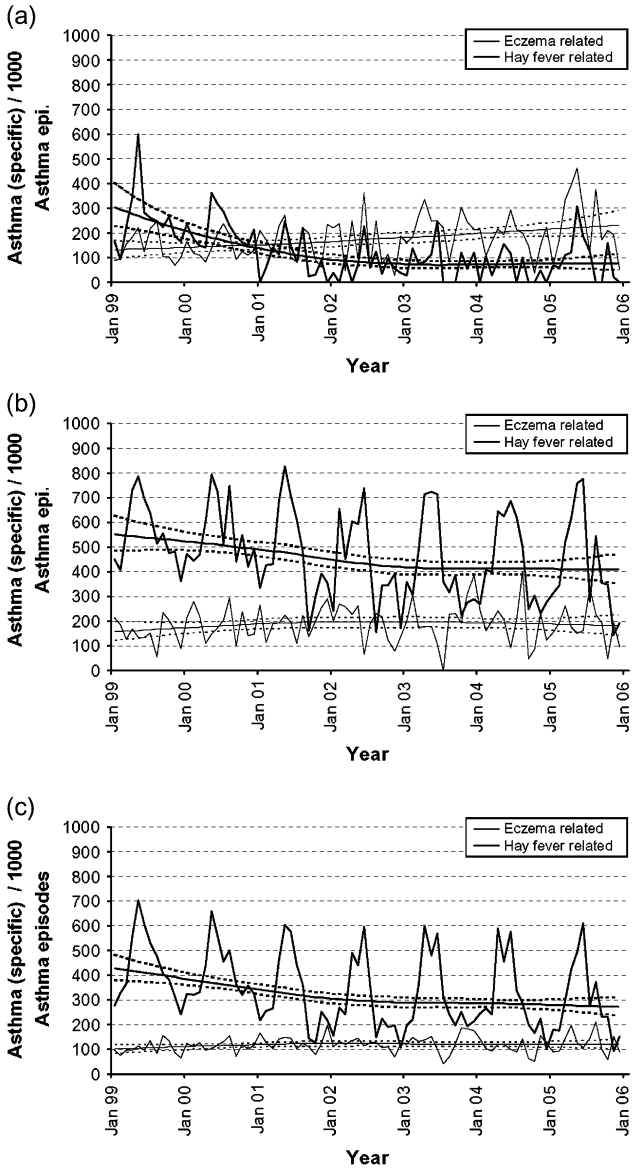

FIGURE 2 *Association of asthma with eczema and hay fever: (a) 0–4 years old, (b) 5–16 years old and (c) all ages*

prevalence of asthma in the SSSN is not based on populations but on consultations as there is no patient's list system in Switzerland. Second, exact age-specific distributions could not be computed as age and sex were collected only for consultations for asthma, but not for the total number of consultations. However, by extrapolation from a two times 2 weeks' registration of age and sex for every consultation in each year (in May and October), it could be ascertained that the age distribution did not change in spite of somewhat changing proportions within primary care physicians in the SSSN. We also accounted for the lack of precise age-specific distribution by referring to age-independent parameters. Third, the physicians' diagnoses have not been validated by objective measures such as skin prick tests, serological tests to determine specific IgE levels or pulmonary function tests. However, self-reported physician's diagnosis of asthma among adults and children has been shown to be fairly specific[15,16] and SSSN physicians were guided by precise diagnostic criteria, which remained unchanged throughout the study period.[11]

Phenotypic categories

Inconsistent findings from incidence studies on asthma may be due to the fact that allergic and non-allergic asthma have not been distinguished from each other in epidemiological studies. Asthma is not a single disease entity. Viral wheeze or transient wheeze is a non-atopic disorder with risk factors and prognosis that differ from the atopy-related wheeze phenotypes which are typical of late onset or persistent asthma in schoolchildren.[17] Similarly, viruses can cause bronchoconstrictive symptoms and signs such as cough and difficult breathing in adults.[18]

In this study, we divided asthma into two broad categories, allergic and non-allergic asthma. The highly discordant peaks between allergic and non-allergic occurrence lines (see Figure 1) reveal the presence of two different entities of asthma and underscore the assumption that participants in the SSSN can discriminate well between wheezing and cough triggered by respiratory infection and/or exercise and allergen-driven episodes of bronchoconstrictive manifestations.

The separate analysis of allergic and non-allergic asthma among 0- to 16-year-old children (making up for 76% of all asthma consultations), seen by paediatricians in the SSSN (98% of all patients seen by paediatricians were in the age range of 0–16), resulted in the same trends for the two phenotypes. This is in agreement with the notion that allergic and non-allergic asthma exist in all age groups[19,20] and that asthma takes its biggest share among children. Typically, viral-induced episodic asthma is more frequent among children than in the all ages group.

Asthma, eczema and allergic rhinitis

Older children and adults experience more asthmatic episodes in May, June and July, an observation which probably reflects the association of hay fever with asthma.[6,7,21] Children with eczema are at high risk of allergic asthma and allergic rhinitis[22]. A link between allergic rhinitis and asthma is evident from epidemiological, pathophysiological and clinical studies.[23] In a primary care-based survey of patients with asthma, 76% of patients with asthma reported symptoms indicative of allergic rhinitis[24]. Based on studies about the relation between asthma and allergic rhinitis, it has even been suggested that asthma and allergic rhinitis should always be considered together in diagnosis and management.[25]

In the present study, the two markers of allergy, eczema and hay fever, were used to define allergic asthma. Other markers such as food allergy or anaphylaxis were not taken into consideration as diagnosis is often uncertain for the former and as they are rare. Non-allergic asthma comprised all other consultations for asthma. We found that eczema showed an inconsistent pattern, increasing among small children and remaining stable among older children and adults, and that hay fever in association with asthma declined between 1999 and 2005. The non-allergic component of asthma did not change in relation to the allergic component. Our findings are in accordance with time trends of allergic disorders in the UK where the prevalence and health care usage for eczema and hay fever was found to have stabilized or even fallen in recent years.[26] Similar findings came off from a review on asthma over the last 50 years in the UK, showing evidence that trends flattened or even began to fall in the late 1990s and early 2000s.[27] The rise in prevalence of asthma, allergic rhinoconjunctivitis and eczema symptoms reported in the ISAAC[4] has come to a still stand as shown by some centres having completed Phase III of that study.[28,29] Our enquiry whether the decline of consultations for asthma in primary care might be linked to there increase with specialists was unproductive as there is no monitoring of such data in the secondary care sector of Switzerland.

A possible explanation for our findings is that the reporting of increasing prevalence rates of asthma in the last decades caused an increased awareness among the general public as well as physicians, which in turn interfered with the diagnostic classification.[30] Before the 1980s, wheezy children were referred to as 'wheezy bronchitis'.[31] Most of these children stop wheezing at school age. Including them under the unifying name of asthma is incompatible with diagnostic accuracy.

The increased use of medications, especially inhaled steroids and beta-agonists in symptomatic subjects, may have led to better asthma control and a decreased health care usage by asthmatic patients. The decrease of hay fever in asthmatic patients may also be explained by ready available treatment by patients with antihistaminic tablets and nasal corticosteroid sprays. Prescription of corticosteroid drugs and bronchodilators in the UK had risen steadily since the early 1970s and prescriptions for both of these categories have levelled off since the late 1990s.[27] In Switzerland, the moving annual total of prescriptions for corticosteroids and bronchodilators, either as a single or as a combined drug, and anticholinergic and antihistaminic drugs as well as leukotriene antagonists, for the two diagnoses of bronchial asthma and obstructive lung disease, shows a 10–15% fall since 2001 (IMS Health, personal communication). While these sales' characteristics could explain the consultation recession for asthma, they cannot explain why the tide of asthma has remained low although medication prescriptions fell at the same time. Might it be that allergic disorders have truly declined in recent years?

Conclusions

Consultations for asthma and hay fever-related asthma in the primary care setting of Switzerland have decreased over time. The clinical distinction between allergic and non-allergic asthma on the basis of the association of asthma with eczema and/or hay fever shows that, most probably, it is the allergic component of asthma which has contributed to this fall. Different coding of asthma with time, therapeutic advances and changes in the health care pattern and usage must be considered as confounding variables in the epidemiological picture of asthma.

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