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Allergic rhinitis in children: Incidence and treatment in Dutch general practice in 1987 and 2001

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ABSTRACT

Allergic rhinitis is a common chronic disorder in children, mostly diagnosed in primary health care. This study investigated the national incidence and treatment of allergic rhinitis among children aged 0–17 yr in Dutch general practice in 1987 and 2001 to establish whether changes have occurred. A comparison was made with data from the first (1987) and second (2001) Dutch national surveys of general practice on children aged 0–17 yr. Incidence rates were compared by age, sex, level of urbanization and season. The management of the general practitioner was assessed regarding drug prescriptions and referrals to medical specialists, and compared with the clinical guideline issued in 1996. The incidence rate of allergic rhinitis increased from 6.6 (1987) to 9.2 (2001) per 1000 person-years. We found a male predominance with a switch in adolescence to a female predominance at both time points. The increase in incidence was the highest in rural (<30,000 inhabitants) and suburban areas (30,000–50,000 inhabitants). Compared to 1987, there was a significant increase in incidence in the central part of the Netherlands in 2001. In both years, the incidence was higher in spring compared with the other seasons. In 2001, children of natives and western immigrants visited the general practitioner more often with complaints of allergic rhinitis compared to 1987. In 1987, prescribed medication consisted mainly of nasal corticosteroids (36%) and in 2001 of oral antihistamines (45%). Although a clinical guideline was not issued until 1996, overall, the treatment of allergic rhinitis by general practitioners was in both years in accordance with the current clinical guideline, but with a stronger adherence in 2001. The results show an increased incidence in the past decades of allergic rhinitis in children in Dutch general practice. The shift to a smaller spectrum of prescriptions in 2001 may be a result of the 1996 clinical guideline.

BACKGROUND

Allergic rhinitis is a common chronic disorder among children and its prevalence has increased throughout Europe over the past five decades (1–4). For example, in Scottish children over a 25 yr period, the prevalence rose from 3% in 1964 to 12% in 1989 (1). Among Swedish schoolchildren, the prevalence of

allergic rhinitis, asthma/wheeze or eczema increased continuously from 24% to 33% between 1979 and 1991 and in Danish children rhinitis increased steadily from 1986 to 2001 (12%–23%) (2, 3). Some studies reported that many environmental factors, such as a western lifestyle, the 'hygiene hypothesis' and air pollution, may contribute to the increasing asthma and atopy rates (5–7).

Allergic rhinitis is characterized by nasal obstruction, sneezing, itching of the nose and/or postnasal drainage, and is often associated with respiratory and ocular symptoms (8, 9). Previously, allergic rhinitis has been subdivided into seasonal and perennial allergic rhinitis. In 1999, the World Health Organisation introduced a new classification of subdividing allergic rhinitis into intermittent allergic rhinitis and persistent allergic rhinitis (ARIA Guidelines), instead of the traditional seasonal and perennial divisions (10).

Symptoms of allergic rhinitis can seriously affect the quality of daily life of children in terms of physical and psychological well-being (9, 11, 12). Therefore, an adequate management of allergic rhinitis may be an important component in improving the quality of life. Also, an adequate management for co-morbid conditions or complicating respiratory conditions such as asthma, eczema, sinusitis, recurrent middle-ear infections, and sleep disorders may be of great importance (8). The direct costs of treating allergic rhinitis and indirect costs (loss of productivity, absence from school resulting from allergic rhinitis) are substantial (13–15).

Allergic rhinitis develops before the age of 20 yr in 80% of all patients with allergic rhinitis (8). Allergic rhinitis is also the most prevalent allergic disorder in children and is mostly diagnosed in primary health care (16). In recent years, national and international guidelines have been developed to enhance the effectiveness and quality of management of patients with allergic rhinitis (17). In 1996, a guideline on allergic rhinitis was issued by the Dutch College of General Practitioners (NHG); this Practice Guideline was updated in May 2006 (18, 19). Knowledge about the incidence and management of allergic rhinitis might improve the care of allergic rhinitis among general practitioners (GP) and may contribute to wider improvements in health and healthcare services and interventions.

Here, we report on the incidence and management of allergic rhinitis in children in Dutch general practice. The research questions were as follows:

1. What is the incidence of allergic rhinitis in children aged 0–17 yr related to age, gender, season, region, and urbanization, and did it change between 1987 and 2001?
2. What is the treatment of allergic rhinitis by GPs, and did this change between 1987 and 2001?

METHODS

Data were analyzed from the first and second Dutch National surveys of general practice, which were performed by the Netherlands Institute for Health Services Research (NIVEL) in 1987 and 2001 (20, 21). Each survey included a representative sample of the Dutch population. In the Netherlands, general practices have a fixed list size, all non-institutionalized inhabitants are listed in a general practice, and GPs have a gate-keeping role. Usually, the first contact with health care, in a broad sense, is the contact with the GP. For the current study, data from both surveys for children aged 0–17 yr were analyzed. The participating GPs were representative for age and gender of all Dutch GPs.

First Dutch National survey 1987

A sample of 161 GPs in 103 practices was randomly selected to participate in the survey. The GPs were divided into four groups, and each group recorded data on registration forms about all contacts between patient and practice during one of four consecutive 3-month periods during 1987. The four registration periods covered one calendar year to correct for seasonal variability of morbidity. Other socio-demographic characteristics (such as ethnicity) were obtained by a questionnaire and filled out by the parents or by the children themselves, if they were older than 12 yr (response rate 91.2%). Data recorded from each consultation included patient characteristics (age, gender), diagnosis, prescription of drugs, and referrals. Specially trained workers used the International Classification of Primary Care (ICPC) to code the diagnoses made by the GP. Prescribed medication was automatically coded using the Anatomical Therapeutic Chemical (ATC) coding system.

Second Dutch National survey 2001

The second national survey was carried out in 2001. Data on all physician–patient contacts during 12 months were extracted from electronic medical records in 104 practices with 195 GPs. The GPs registered all health problems presented within one consultation and coded diagnoses using the ICPC. Also, all drug prescriptions (coded according to relevant ATC classification) and referrals made by the GP were extracted. Patient characteristics such as age and gender were derived from the GPs' computerized patient files. As in 1987, data on ethnicity were obtained by a questionnaire (response rate 76%). For the current analysis, data from 9 of the 104 practices (10 GPs) were excluded for the following reasons: five practices with inadequate registration of patient contacts or drug prescription were excluded after quality control, four other practices were excluded because of software problems.

Episodes of disease

Both surveys were episode oriented, meaning that a consultation on a new health problem marked the beginning of a new episode. If there were multiple consultations in a single episode, chronologically the last diagnosis made was considered the diagnosis of the episode.

To identify the episodes for allergic rhinitis, we selected all episodes coded with ICPC code R97: Hay Fever/Allergic rhinitis. Medication was selected using the ATC codes. The ATC codes of interest were R06A (antihistamines for systemic use), R01A (decongestants and other nasal preparations for topical use, i.e., nasal steroids) and S01G (ophthalmologic decongestants and antiallergics).

The management of the GP was assessed regarding drug prescriptions and referrals to medical specialists and compared with the clinical guideline issued in 1996 (18). Both surveys provided the opportunity to determine the incidence and management of allergic rhinitis according to age, gender, region, season, and urbanization. For age, children were divided in subgroups of age 0–4, 5–9, 10–14, and 15–17 yr. Urbanization was categorized into four categories based on the size of the municipality: <30,000 inhabitants (rural areas), 30,000–50,000 inhabitants (suburban areas), >50,000 inhabitants (urban areas) and 'large cities' (Amsterdam, Rotterdam, and The Hague). The Netherlands was divided into a Northern, Central, and Southern region. Season was divided into spring (April–June), summer (July–September), autumn (October–December), and winter (January–March). Ethnicity was derived from the country of birth of the parents. If either parent was born in Turkey, Africa, Asia (except Japan and Indonesia) and Central or South America, their children were considered to be children of non-western origin (in accordance with the classification of Statistics Netherlands). All other children were defined as western. Hence, children of western origin included children from the native population and children from parents born in other western countries (20, 21).

Ethical approval

The surveys were carried out according to Dutch legislation on privacy in 1987 and in 2001. The privacy regulation of the second survey was approved by the Dutch Data Protection Authority. According to Dutch legislation, obtaining informed consent is not obligatory for observational studies.

Statistical analyses

We defined incidence as the number of new episodes of allergic rhinitis per 1000 person years. Statistical analyses were performed using SPSS 11 and STATA 8.0 SE. The 95% confidence intervals (CI) were calculated assuming a Poisson distribution.

We calculated the incidence rate by dividing the total number of new episodes (numerator) by the study population at risk multiplied by the follow-up time (denominator). In 1987, the denominator was calculated by multiplying the number of all patients listed in the participating practices by the follow-up time (person years). In 2001, persons who moved into or out of the participating practices during the registration period were assumed to contribute for half-a-year to the follow-up time. The so-called mid-time population was calculated as the mean of all listed patients (aged 0–17 yr) of all participating GPs, at the beginning and at the end of the registration period. Data were stratified for age categories, gender, urbanization level, region, season, and ethnicity.

RESULTS

Study populations in 1987 and 2001

In 1987, 86,577 children aged 0–17 yr participated and in 2001, 81,716 children aged 0–17 yr participated. In these groups, 143 first contacts of allergic rhinitis occurred in 1987 (during four consecutive 3-month periods) and 753 in 2001 (during 12 months). These first contacts formed the basis for our calculation of the incidence rates for allergic rhinitis.

Incidence

The incidence of allergic rhinitis in children in 1987 was 6.6 (CI: 5.6–7.8) per 1000 person years. In 2001, the incidence increased to 9.2 (CI: 8.5–9.9) per 1000 person years, i.e., a significant increase of 39% compared to 1987.

The incidence by age and gender is presented in Figs 1 and 2 and in Table 1. Table 1 shows that the peak age group of allergic rhinitis was 15–17 yr in both surveys. In 2001, the incidence rate of allergic rhinitis in younger children (5–9 yr) is almost double compared to 1987 ($p = 0.002$). In 2001, the age group 10–14 yr also presented allergic rhinitis more frequently to the GP than in 1987 ($p = 0.003$). Comparing Figs 1 and 2 shows that girls have a steeper increase in incidence of allergic rhinitis by age, accelerating after the age of 14 yr.

[FIGURE 1]

[FIGURE 2]

[TABLE 1]

In 2001, the incidence rate of allergic rhinitis increased significantly in rural areas (<30,000 inhabitants) and suburban areas (30,000–50,000 inhabitants) compared to 1987 ($p < 0.001$ and $p = 0.019$, respectively). The incidence rates in other urbanization levels remained stable in both surveys (Table 1). In 1987, there was a significantly lower incidence rate in rural areas compared to other urbanization levels ($p = 0.05$), whereas in 2001, there was a significantly lower incidence rate in large cities compared to other urbanization levels ($p = 0.05$).

Allergic rhinitis was more frequent in the central part of the Netherlands in 2001 compared to 1987 ($p < 0.001$). In both surveys, we found the highest incidence rate in the southern part, although the differences were not significant. There was a peak incidence in spring in both surveys; in 2001 the spring incidence rate of allergic rhinitis was more than doubled compared with 1987.

In 2001, western children (natives and western immigrants) visited the GP more often with complaints of allergic rhinitis compared to 1987 ($p = 0.001$).

Prescriptions

Table 2 shows medication prescriptions during the first contact for an allergic rhinitis episode. Table 3 presents the type of prescribed medication for allergic rhinitis in the first contact. In 1987, the GPs issued 137 prescriptions in the first contact. In 1987, a prescription was written in 77.6% of all first consultations and in most cases (62.7% of all cases) the GP prescribed only one drug. In 2001, the GPs made 669 prescriptions in the first contact for the first episode. In 68.5% of the episodes, the GP prescribed medication in the first contact; in 50.9% of these first episodes, only one drug was prescribed.

[TABLE 2]

[TABLE 3]

In both surveys, majority of the children were treated with decongestants or other nasal preparations (R01A) and antihistamines (R06A), which is in accordance with the 1996 clinical guideline. From 1987 to 2001, prescriptions for antihistamines (R06A) rose from 23% to 45%. The number of prescriptions for drugs for nasal symptoms (R01A) remained stable over the last 15 yr, whereas prescriptions for anti-

inflammatory eye drops (S01G) increased from 7% to 13%. The prescriptions in 1987 showed a wider variety of medication type shifting in 2001 to a smaller spectrum.

Referral to medical specialists

Relatively few children were referred to a medical specialist. In 1987, only four of 143 children (1.4%), and in 2001, four of 753 children (0.5%) with allergic rhinitis were referred to the hospital. In both the surveys, most children were referred to ENT specialists.

DISCUSSION

The results of this study show that the incidence of allergic rhinitis in children in general practice in the Netherlands has increased by almost 40% between 1987 and 2001. This increase is in accordance with previous studies showing an increase ranging from 40% to almost 400% in the general population worldwide (1–4). The huge increases were found in the periods 1964–1989 (1) and in 1979–1991 (2). More recent studies (3, 22) demonstrate a less extreme increase and it is evenly suggested that the prevalence of allergic rhinitis may be stabilizing over the recent decades (22).

Our results may be considered representative for all children treated in primary care in the Netherlands. Although childhood consultation rates in general practice have decreased over the past 15 yr, respiratory problems are still the most frequently presented health problem in children (23). In recent years, advertisements have increasingly targeted allergy medication, which are available without prescription (over-the-counter drugs), which could have reduced the consultation behavior of parents and children. This could indicate that the incidence of allergic rhinitis in the population is even higher.

In both surveys, we found that more boys were affected than girls. However, after adolescence a switch is found to females, who are affected slightly more than males. In childhood, allergic rhinitis is more common in boys than in girls (8, 9). The increase in the incidence rates among girls in adolescence may be explained by a change of interpretation of complaints and visiting the GP for those complaints. In adolescence, girls are more likely to overestimate the severity of the disease whereas boys tend to underestimate (24–27). The gender differences and age-related differences, which we observed may also be related to differences in the hormonal environment (28).

In 2001, we found a significant increase in the incidence of allergic rhinitis in rural (<30,000 inhabitants) and suburban areas (30,000–50,000 inhabitants) compared to 1987, which is in accordance with previous studies (29, 30). However, rural living has been associated with a lower prevalence of atopy and allergic rhinitis in both children and adults (29, 31). An explanation for this discrepancy can be that environmental changes affect the whole society, which promotes an increase in allergic rhinitis in both rural and urban environments (29). In 2001, we found a significant unexplained lower incidence rate in large cities compared to other urbanization levels in 2001.

In both surveys, the incidence was the highest in spring, meaning that most visits to the GP for hay fever are as expected in spring (8, 9). Although most visits were in spring, the visits for complaints of allergic rhinitis in summer, autumn, and winter were substantial in both surveys. Allergic rhinitis in spring may represent intermittent (previously called 'seasonal') as well as persistent rhinitis.

GP management

The management of allergic rhinitis consists of a pharmacological therapy and a non-pharmacological therapy, such as allergen avoidance advice (18). Although a clinical guideline was not issued until 1996, the treatment of allergic rhinitis by GPs in 1987 was more or less in accordance with the guideline. The prescriptions in 1987 showed a wider variety of medication type and shifted in 2001 to a smaller spectrum; this could be a result of the 1996 clinical guideline (18). In 2001, the participating GPs treated allergic rhinitis in children according to the 1996 clinical guideline for general practice. Relatively few children were referred to a medical specialist.

Limitations of this study

There were small differences in the design of the two national surveys, which might hinder comparability of the data. Some of the differences in occurrence may be explained by the fact that ICPC coding was not performed the same in both surveys: in 1987 clerks coded diagnoses afterwards by hand, whereas in 2001 the GPs coded the diagnoses themselves during the consultation in a computerized patient file. This might result in differences concerning the incidence rate of allergic rhinitis. Some cases of allergic rhinitis might

be missed when clerks recode doctor's diagnosis afterwards, resulting in an unintentional lower incidence rate in 1987. Furthermore, we have no information on non-pharmacological treatment, such as advice.

CONCLUSION

The incidence of allergic rhinitis among children in general practice in the Netherlands has increased by almost 40% over the past 15 yr. The shift to a smaller spectrum of prescriptions in 2001 may be a result of the 1996 clinical guideline.

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FIGURES AND TABLES

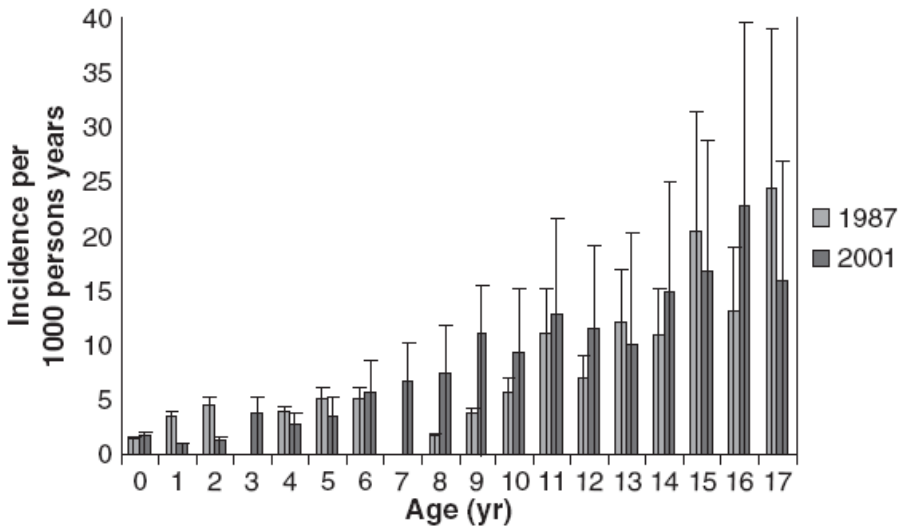

Fig. 1. Incidence rate of allergic rhinitis in girls in 1987 and 2001 by age per 1000 person years.

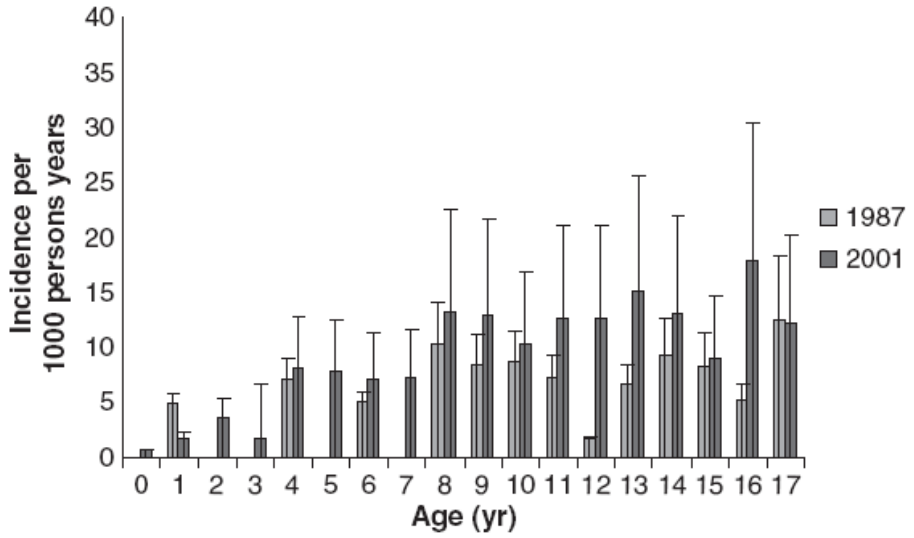

Fig. 2. Incidence of allergic rhinitis in boys in 1987 and 2001 by age per 1000 person years.

Table 1. Incidence rate and 95% confidence interval of allergic rhinitis in children aged 0–17 yr, by age group, urbanization level, region, and season in 1987 and 2001 per 1000 person years

	1987		2001		
	Incidence per 1000 person years		Incidence per 1000 person years		
	0–17 yr	95% CI	0–17 yr	95% CI	p-value
Age categories (yr)					
0–4	2.9	1.5–5.0	2.7	2.1–3.5	0.817
5–9	4.8	3.1–7.2	8.4	7.3–9.7	0.002
10–14	8.1	6.0–10.9	12.2	10.9–13.8	0.003
15–17	13.5	10.3–17.66	15.8	13.7–18.0	0.282
Urbanization level					
<30,000 inhabitants	5.1	3.6–6.9	9.0	8.1–10.1	<0.001
30,000–50 000 inhabitants	7.0	5.3–9.1	9.9	8.4–11.6	0.019
>50,000 inhabitants	8.5	6.0–11.7	9.7	8.6–11.0	0.407
Large cities*	7.3	4.0–12.7	6.0	4.1–8.4	0.549
Region					
North	5.3	2.8–9.1	7.7	6.2–9.5	0.157
Mid	6.4	5.1–7.9	9.4	8.6–10.3	0.001
South	7.7	5.5–10.5	9.5	8.3–9.9	0.186
Season					
Winter	4.6	2.9–6.9	4.8	3.9–5.9	0.826
Spring	9.4	7.2–12.1	22.7	20.7–24.9	<0.001
Summer	7.7	5.3–10.7	5.2	4.3–6.3	0.077
Autumn	4.5	3.0–6.5	4.3	3.4–5.3	0.834
Ethnicity					
Natives & western immigrants	6.4	5.2–7.8	9.7	8.9–10.6	<0.001
Non-western immigrants	9.1	4.6–16.3	10.5	8.0–13.5	0.652
Missing ethnicity	6.6	4.1–8.2	7.7	6.7–9.0	0.111
Total	6.6	5.6–7.8	9.2	8.5–9.9	<0.001

Table 2. Number and percentage of prescriptions during first contact of allergic rhinitis episode in 1987 and 2001

	1987		2001	
	n	%	n	%
Total number of episodes	143	100	753	100
No prescription	32	22.4	237	31.5
One prescription	89	62.7	383	50.8
Two prescriptions	18	12.7	115	15.3
Three prescriptions	4	2.8	18	2.4

Table 3. Prescribed medication in the first contact from an episode of allergic rhinitis in 1987 and 2001

	1987		2001	
	n	%	n	%
Total prescriptions in the first contact of episode	137	100	669	100
R06A antihistamines for systemic use	32	23.3	303	45.3
R01A decongestants and other nasal preparations for topical use	49	35.8	240	35.9
S01G decongestants and antiallergics	10	7.3	89	13.3
J01A tetracyclines	2	1.5	0	0
J01C beta-lactam antibacterials, penicillins	3	2.2	0	0
J03B anti infectives for systemic use	2	1.5	0	0
R03A adrenergics, inhalants	2	1.5	9	1.4
R03B other drugs for obstructive airway diseases, inhalants	3	2.2	2	0.3
R03C adrenergics for systemic use	3	2.2	2	0.3
R05C expectorants, excl. combinations with cough suppressants	3	2.2	1	0.1
S03C corticosteroids and anti infectives in combination	4	2.8	0	0
V01A allergens	3	2.2	0	0
Other	21	15.3	23	3.4