Incidence of allergic rhinitis in general practice, 1981-92

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Abstract

Objectives—To determine the epidemiology of hay fever and to consider the role of pollution.

Design—Examination of data on weekly incidence of allergic rhinitis and hay fever by age, sex, region, and location.

Setting—Royal College of General Practitioners Weekly Returns Service. Practice data were based on registered populations of 220 000 in 1981, rising to 700 000 in 1992 from England and Wales.

Main outcome measures—Numbers of new cases of hay fever and allergic rhinitis. Data on pollen counts for Darlington, Derby, and London.

Results—The incidence of allergic rhinitis fluctuated greatly from year to year but showed no trend. Peaks in hay fever coincided with peak pollen counts. No important differences were found between urban and rural locations or different parts of the country with respect to both size and timing of the peaks. Incidence was highest in children (5-14 years).

Conclusions—The similarity of the results throughout England and Wales does not support an important role for local pollutants in hay fever. However, the possibility that levels of pollutants are high enough to act as an adjuvant in hay fever across the whole study area has not been excluded.

Introduction

The Weekly Returns Service of the Royal College of General Practitioners was established in 1965. Although it initially collected data on infectious diseases, the scope of the service has since increased and it now collects total morbidity data. Data on allergic rhinitis have been included since 1981. The term allergic rhinitis embraces disease due to a variety of allergens, the commonest of which is pollen. Allergy to pollen is recognised as hay fever or seasonal rhinitis. In this paper we use allergic rhinitis when annual data are considered and hay fever to describe allergic rhinitis in the hay fever season, which necessarily includes allergic rhinitis due to other allergens.

The incidence of allergic rhinitis and hay fever is thought to have increased in recent years,^{4,6} and pollution has been suggested to be partly responsible.^{4,6} Three morbidity surveys based in general practice in England and Wales found that the prevalence of allergic rhinitis increased from 5.1 per 1000 population in 1955-6 to 10.6 per 1000 in 1970-1 and to 19.7 per 1000 in 1981-2. A study in Denmark reported a consultation rate for allergic rhinitis of 15/1000 population in 1977-8.¹⁰ Postal questionnaire surveys in general practice, however, have reported prevalences of 24% and 29%.^{11,12}

We have analysed data from the Weekly Returns Service to determine whether the incidence of allergic rhinitis, and in particular hay fever, is increasing and to look at the evidence regarding the role of air pollution.

Methods

The Weekly Return Service currently receives data from 92 sentinel practices, which serve a total population of 700 000. It has increased in size about threefold since 1981 when it covered 222 000 people. New episodes of illness are recorded by diagnosis, totalled at the end of each week according to age and sex groups, and sent immediately to our unit. The number of patients on the practice registers provides the denominator for calculating rates. We defined the hay fever season as weeks 13 to 33 (end of March to middle of August) based on an examination of data for 1981-92. A new episode was identified when a patient reported a problem for the first time or had a new episode of a previous problem. Incidence data are presented for all practices reporting to the service and for the 25 practices which provided data continuously from 1981 (population 159 000) to 1992 (population 174 000). We aggregated data into roughly equally populated regions (north, central, and south). The central region was defined by a northerly line linking the Mersey and Humber and a southerly line linking the Bristol Channel and Ipswich. We also divided practices into east and west regions by a line joining Portsmouth to Hexham (see map). Based on the site of the main surgery 75% of the population were located in urban and 25% in rural areas.

We obtained data on pollen levels since 1987 from the National Pollen and Hayfever Bureau (Darlington), the Midland Asthma and Allergy Research Association (Derby), and the Pollen Research Unit, University of North London (London), representing sites in the north, central, and south regions.

Results

Table I gives the mean weekly population included in the Weekly Returns Service and the total number of episodes of allergic rhinitis and hay fever diagnosed by general practitioners in 1981-92. About 86% of episodes occurred during the hay fever season (weeks 13-33). The age and sex distribution of the population covered by the Weekly Returns Service is similar to that of the national population.

TABLE I—Mean weekly population and numbers of new episodes of allergic rhinitis in total and in hay fever season

Year	Mean weekly population	Total No of new episodes	No of new episodes in hay fever season
1981	196 362	2592	2225
1982	195 022	2232	1889
1983	204 676	2652	2314
1984	206 893	2561	2250
1985	196 798	1940	1665
1986	216 486	2325	2039
1987	233 597	2421	2056
1988	343 661	4353	3763
1989	383 498	5454	4905
1990	403 517	4657	3927
1991	461 085	5969	4819
1992	599 923	13833	12342

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BMJ 1994;308:897-900

FIG 1—Mean weekly incidence of allergic rhinitis, 1981-92

FIG 2—Mean weekly incidence of hay fever by age group, 1988-92

FIG 3—Mean incidence of hay fever each week by region and urban or rural location, 1988-92. Pollen counts for each year are shown for Derby: one unit of scale = one tenth of total weekly pollen count

Figure 1 shows the mean weekly incidence of allergic rhinitis in each year for the total study population and for the 25 practices which provided data for all years. Both show annual variation, with the highest incidence in 1992 (42 per 100 000). Incidence was lowest during 1985-7. The incidence in the 25 practices was similar to that in the whole population.

Figure 2 shows the mean weekly incidence of hay fever by age group for the last five years of the study. The incidence was highest in the age group 5-14 years followed by the 15-44 year group. The variation in incidence from year to year was similar for each age group.

Figure 3 shows the mean weekly incidence of hay fever by region and location. The size and timing of peak incidence differed each year, but within each year the incidence was similar in all regions and locations. Hay fever usually starts in early April (weeks 15-17) and rises gradually to a peak in June (weeks 23-27) before falling to a background rate of around 4/100 000. In some years (1988, 1989, and 1992, for example) clear subsidiary peak incidences were seen in May. These occurred in all regions and locations. Total weekly grass pollen counts for Derby are also shown (fig 3).

Figure 4 gives the mean weekly incidence for hay fever in the age groups 5-14 and 15-44 years by location for 1981-92. Rates were higher in urban than rural areas in patients aged 15-44 years for all 12 years, with the biggest differences in 1983-5 and 1987. Urban rates were higher in 5-14 year olds from 1985 onwards. The difference between urban and rural incidence was greatest in years with comparatively low incidence. These apparent differences should be seen in the light of increased reporting of new episodes of total acute respiratory disease (excluding hay fever) and chickenpox in urban practices. Table II shows the ratios of urban to rural reporting during the hay fever season in 1989 and 1992 as example years.

Mean weekly incidence rates of allergic rhinitis for men and women were similar for 1982-8, but after 1988 the rate was slightly higher in women (4.5/100 000). Combined age and sex specific rates have only recently been available in the Weekly Returns Service. We examined the effect of sex in 1992 as an example year

FIG 4—Mean weekly incidence of hay fever by age group and urban rural location, 1981-92

TABLE II—Ratio of urban to rural incidences of hay fever, total acute respiratory diseases, and chickenpox in 1989 and 1992 in the age groups 5-14 and 15-44 years

	1989		1992	
	5-14	15-44	5-14	15-44
Hay fever	1.16	1.26	1.06	1.11
Total acute respiratory disease	1.22	1.19	1.23	1.18
Chickenpox	2.22	1.50	1.59	1.44

FIG 5—Mean weekly incidence of hay fever by age and sex, 1992

(fig 5). The incidence was higher in boys than girls but greater in women than men.

Analysis of pollen data from the three centres for the last six years showed that the peak incidence of hay fever coincided with the weeks of highest grass pollen count in all regions in all years except 1990, when counts were very low (2800 grains/m³ total for May to August compared with 5400/m³ in 1989 and 5000 in 1992 (Derby). In 1987 and 1991 the high pollen counts occurred relatively late, as did the peak of hay fever.

Discussion

The incidence of allergic rhinitis varied year by year, with no underlying trend. The incidence was particularly high in 1992, with an estimated annual prevalence of 2.2% (52× weekly incidence). Incidences were similar in the 25 practices which provided data for the whole study period. The small differences probably reflect more consistent classification of episodes of illness by these practices than by those falling out of the service and by new recruits. Terfenadine became available from chemists in 1985, which may have reduced the number of general practice consultations for hay fever. A large proportion of sufferers, however, are children and students, who would be exempt from prescription charges and still likely to consult.

The prevalence of hay fever doubled between each of the three national morbidity surveys.⁷⁻⁹ We found no increasing trend in hay fever incidence over the last 12 years. Our rates and those from the morbidity surveys cannot be compared directly because we measured weekly incidence and the morbidity surveys measured annual prevalence. Both the prevalence of allergic rhinitis reported in the third survey, which was 2.0%, and our rough estimate of 2.2% for 1992 are substantially less than the 24% in 16-65 year olds reported by Sibbald and Rink or 29% in 11-59 year olds reported by Richards *et al* from patient questionnaires.^{11,12} Aberg reported a prevalence of 8.4% in 18 year old male Swedish conscripts in 1981 and noted an increase from 4.4% in 1971.²

REASONS FOR VARIATION

Several factors explain the wide range of results from hay fever studies. Firstly, age is critical. Hay fever is commonest in children and young adults; many of the studies report from different age groups. Secondly, there is a social class gradient in the prevalence of hay fever, with people in the non-manual social classes reporting higher rates than those in manual social classes.¹³ Thirdly, incidence varies year by year. Studies over only one or two years cannot be extrapolated as climatic conditions in May and June greatly affect the dissemination of pollen. Questionnaire surveys based on recall are likely to be affected by the timing of the questionnaire in relation to the hay fever season and on the severity of the most recent epidemic. Many patients who perceive their symptoms to be of insufficient severity to consult a doctor will be identified in questionnaire surveys but not in general practice based surveys.^{11,12} Fifthly, accuracy of diagnosis affects some surveys. Sibbald and Rink found that doctors in one London practice correctly labelled hay fever provoked by grass in 76 out of 86 patients (88%) but were less good at labelling those with allergic rhinitis at other times of the year—30 out of 68 (44%). Our data are based on the diagnoses given by the recording doctors. Though diagnostic bias undoubtedly exists in individual practice data, the database includes a large number of practices, and individual practice bias should be absorbed. Practices in the Weekly Returns Service are known to be consistent over time in their use of diagnostic terms.¹⁵ A recent factsheet published by the Lung and

Asthma Information Agency compared seasonal data on hospital admissions for asthma with data from the Weekly Returns Service and found these to be highly concordant.¹⁶

Lastly, pollen counts and treatments for hay fever are now widely publicised by the media. This may influence patients' decisions to consult a doctor and have affected our results in recent years.

PEAK INCIDENCE

Peak incidence varied each year and coincided with grass pollen peaks during 1987 to 1992. In some years a smaller peak occurred in May, when tree pollens were present. Pollen from oil seed rape is also present at this time, but it is thought to be a weak allergen.¹⁷ Birch pollen is a common cause of symptoms in Scandinavian countries¹⁸ and cedar pollen in Japan.⁶ However, birch pollen levels were high around weeks 14-17, when the incidence of hay fever was low. In May 1992 a peak in hay fever coincided with a peak in oak pollen (Derby). Though grass pollen is undoubtedly the main cause of hay fever, further research is needed into the role of tree pollens.

The size and timing of peak incidence was similar in all regions (north, central, south, east, west). The highest pollen release is reported to occur two weeks later in the north of England than the south,¹⁹ but we found no matching trend in the incidence of hay fever. However, our practices in the north average at York and in the south at London, reducing the distance between them.

URBAN AND RURAL LOCATIONS

The incidence of hay fever and allergic rhinitis was higher in urban than in rural areas. The size of the difference during the hay fever season was generally small, though it was greater in years with comparatively low incidence. The difference between urban and rural practices remained after standardisation for age, though the large age bands (for example 15 to 44 years) may have concealed some of the difference.

In an analysis of a subset of these data Thomas *et al* reported a significant difference between urban and rural rates of seasonal and non-seasonal allergic rhinitis.²² Data on total acute respiratory disease and chickenpox, however, suggest these differences are likely to be due to consultation or possibly recording bias. The excess incidence in women may also represent consultation or recording bias. A French study reported no difference in the prevalence of hay fever between adults living in urban and rural areas,²¹ and national morbidity surveys show that patients in urban areas consult more often than those in rural areas, particularly for less serious problems.¹³ Standardised consulting ratios (with 95% confidence intervals) for trivial illness were urban male 102 (101-104), rural male 84 (81-87), urban female 102 (101-103), and rural female 89 (86-91).¹³

IMPORTANCE OF POLLUTION

Although pollution from coal fires and industrial smoke has reduced, levels of nitrogen oxides and ozone have increased in cities because of cars. Irritant damage to the nasal mucosa has been suggested to aggravate hay fever. Finn suggested that hay fever is an industrial disease, mainly because there are few reports of hay fever before the industrial revolution.²² The main evidence that fuel pollutants can aggravate hay fever comes from animal studies.²³ In a Japanese study the primary IgE antibody response in mice immunised with intraperitoneal injections of ovalbumin mixed with diesel exhaust particulates was higher than that in animals immunised with ovalbumin alone.³

Ozone is produced when nitrogen oxides combine with sunlight and also occurs naturally. Ozone levels

Practice implications

- The number of people affected by hay fever is thought to be rising, and pollution from cars has been implicated
- In this study the incidence of hay fever reported by general practitioners showed no consistent trend
- The size and timing of peak incidence was similar in all regions of England and Wales and in urban and rural populations
- Local pollution levels are unlikely to affect the incidence of hay fever greatly

are generally higher in the countryside. Molino *et al* reported that in asthmatic patients the fall in lung function due to inhaled allergens was more pronounced if they had previously inhaled ozone.²⁴ The effect of ozone on hay fever is not known. Evidence from population studies is conflicting. Ishizaki *et al* found that the incidence of red cedar pollen rhinitis in Japan was directly related to the level of pollutants. Cedar tree pollinosis in Japan was rare before 1964 but is now common.⁵ The number of cedar trees has not changed, but the number of motor cars has risen enormously.

In a questionnaire study von Mutius *et al*⁶ found that symptoms of rhinitis were reported in 16.6% of children in Leipzig and 19.7% in Munich ($P < 0.05$). They suggested that the difference was due to higher levels of nitrogen dioxide from exhaust fumes in Munich. However, the studies in the two cities were held in different years and the questionnaires were administered at different times of the year (Munich September 1989 to July 1990; Leipzig January 1991 to June 1991).

Our results show that hay fever occurs at a similar time in all regions and urban and rural locations in England and Wales. This is not consistent with an effect of a local pollutant. The variation in the timing of hay fever incidence each year and its relation to grass pollen levels, the maximal impact in children, and the increased rate among non-manual workers¹³ also argue against a significant role for pollution. The possibility that levels of ozone or nitrogen oxides (or another pollutant) are high enough to act as an adjuvant in hay fever and affect all regions to a similar extent, has not, however, been excluded by this study.

The Weekly Returns Service is funded by the Department

of Health. We thank the staff and doctors of the recording practices and the staff of the research unit, particularly Joan Dainty for typing the manuscript, K W Cross for advice, and Julie Corden and Jean Emberlin for supplying data on pollen. We also thank Emma Thomas, who, as a medical student, initially investigated the data regarding urban and rural practices.

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(Accepted 7 February 1994)

A MEMORABLE PATIENT

The bee keeper

He was 19 years old and had congenital agammaglobulinaemia. He had been on the ward for several weeks with severe pain of uncertain cause.

He was a simple person; not in the sense of stupid or dull witted, but honest and uncomplicated with nothing hidden. Throughout his illness he remained cheerful, with a faith in God which sustained him. He was a bee keeper and spoke enthusiastically of his interest.

Surgery and biopsy showed a highly malignant and unusual form of sarcoma. He was told the nature of his illness, and arrangements were made for hospice care.

One sunny morning, soon after his operation, I saw him in the day room. He was in a chair and had his back to the door. He did not hear me enter the room. I intended to speak to him. As I drew near to the back of his chair I noticed he was writing on a scrap of paper. I remained

silent. Looking over his shoulder I read the words he had written, and I was so moved that I felt compelled to copy them into my notebook. I believe he was attempting to summarise his philosophy of life. Perhaps it was part of his "unfinished business."

Here is what he wrote: "Beekeeping is an enjoyable hobby if you are not frightened of bees and stings. You can learn the nature of them. Keeping bees is like keeping a pet but in a different way. You do the looking after but they do the work. It can be like gardening, what you put in and do you get rewarded."

It is not perfect English but nevertheless contains a profound truth. He died shortly afterwards.—KEITH WALTERS is a registrar in accident and emergency medicine in Wakefield