

Original article

Incidence and remission of self-reported allergic rhinitis symptoms in adults

Background: A few studies have examined the incidence and remission of allergic rhinitis (AR) in the same general population.

Methods: A questionnaire focused on respiratory symptoms and airway diseases was mailed out in 1992 and in 2000 to the same subjects. Of 4933 subjects, in 1992 aged 20–59 years, 4280 (86.8%) answered at both occasions. AR was defined on self-reported AR and a simultaneous report of nasal symptoms provoked by exposure either to tree-, grass-pollen, furred animals or house dust. Multiple logistic regression adjusted for age and gender was used to analyze potential predictors, reported in 1992, for incidence and remission of AR.

Results: The prevalence of AR increased from 12.4% in 1992 to 15.0% in 2000. The incidence of AR from 1992 to 2000 was 4.8%, while 23.1% of the cases with AR in 1992 stated no AR symptoms in 2000 indicating remission. The highest incidence was seen in the youngest age group (20–29 years), whereas remission was highest in the oldest age group (50–59 years). Asthma symptoms during the last year (as reported in 1992) predicted increased incidence of AR and less chance for remission, 1.89 (95%CI 1.08–3.31) and 0.52 (0.31–0.87), respectively. Family histories of AR or asthma predicted increased incidence of AR 1.99 (1.42–2.80) and 1.62 (1.10–2.37), respectively, but were not associated with chance for remission, OR = 1.23 (0.81–1.87) and 0.94 (0.60–1.48).

Conclusion: This study showed that AR became more common between 1992 and 2000, but also indicated remission in about 20% of the cases within the 8-year period, particularly in older ages. Asthma seems to be associated with higher risk for AR as well as less chance for remission, while heredity of asthma (or AR) may only be associated with the risk for the development and not remission of AR.

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Allergic rhinitis (AR) is characterized by nasal symptoms, which are produced when allergens meet the nasal mucosal surface. AR often co-exists with asthma and bronchial hyper responsiveness and there is accumulating data that AR and asthma have increased in frequency during the last 40 years.

Several epidemiological studies have calculated the prevalence of AR and asthma in different regions worldwide. The prevalence seems to vary between different regions, and affect up to 50% of the population in certain countries (1). The reason for the increase is still unknown, but certain life style factors have been suggested to be involved (1). In contrast to many prevalence studies on rhinitis, a few have investigated the incidence and remission in the same population. We investigated rates of incidence and remission of self-reported AR symptoms in an adult Swedish population sample, who both in 1992 and 2000 answered a questionnaire focused on respiratory diseases and symptoms. We also assessed certain individ-

ual factors that could be important both for the incidence and remission of AR.

Methods

The study area, population and also the lung part of the questionnaire has been described previously (2).

Study area

The present study was performed in Sk  ne, the southern-most county of Sweden. The study area included Malm  , the third largest city in Sweden, and all of its surrounding municipalities with a mixture of densely populated and rural regions.

Study population

The study population consisted of 4933 randomly selected subjects, aged 20–59 years, from the Swedish Population Register who in

1992 responded to the same respiratory questionnaire. The response rate in 1992 was 72.1%. In 2000, the study population also comprised 143 subjects who since 1992 had moved outside the study area, to other parts of Skåne or to some of its three neighboring counties.

Questionnaire

The questionnaire in 2000 had the same layout as the one used in 1992 (2) and it comprised two parts entitled 'Questions of the Lung' and 'Questions of the Nose' (Appendix I). The 'Questions of the Lung' were based on the questionnaire used in the OLIN-studies (3). In turn, this questionnaire was developed from the British Medical Research Council questionnaire (4). The 'Questions of the Nose' were specifically developed for our study in 1992 (2). Both in 1992 and 2000 the questionnaires were posted in May. If no response was received within 2 weeks a first reminder was sent out, and finally, after 10 weeks, a second, final reminder including a new questionnaire was mailed.

Prevalence of allergic rhinitis. The prevalence of AR was assessed from positive answers to both questions 'Do you have or do you have had hay fever?' and 'Do you have nasal symptoms' either 'permanently' or 'recurrently'? Moreover, a report was required that at least one of the following four environmental factors provoked nasal symptoms: tree-, grass pollen, furred animals, or house dust.

Incidence of AR. Calculation of the cumulative incidence rate of AR between 1992 and 2000 was based on subjects with a negative answer in 1992 to the question: 'Do you have or do you have had hay fever?' and with no report of nasal symptoms provoked by either tree-, grass pollen, furred animals, or house dust. To be considered to have AR in 2000 the criteria for prevalence of AR had to be met (see above).

Remission from AR. Calculation of the remission rate of AR was based on subjects who met the criteria for prevalence of AR in 1992 (see above). Remission was considered when none of the four environmental factors: tree, grass pollen, animals, or house dust were reported to cause nasal symptoms in 2000.

Definition of asthma. Asthma was defined as a positive answer to the question: 'Have you been diagnosed by a doctor as having asthma?'

Smoking habits. Subjects with a positive answer to the question: 'Do you smoke?' or 'Have you stopped smoking during the last 12 months?' were classified as current smokers. Subjects who had smoked but stopped smoking more than a year ago were classified as ex-smokers. The rest were classified as never-smokers.

Statistics

The prevalence of a disease or a symptom was calculated as percentage of positive answers to a question. Nonresponders to a single question were quoted as having answered: 'No/do not know'. The population was divided into four age groups according to their age in 1992; 20–29, 30–39, 40–49, and 50–59 years. Odds ratios (OR) and 95% confidence intervals for potential predictors, as reported in the 1992 questionnaire, of the incidence or remission from AR from 1992 to 2000 were calculated by logistic regression, while adjusting for the influence of age and gender. Chi-squared analyses were used for comparisons of prevalence rates between different groups. The computer-based analysis-program SPSS version 10.1 was used for all calculations. Analyses of age dependent trends regarding incidence and remission rates were made by Spearman's rank correlation test.

Results

Participation

In 2000, in total 9316 individuals (78.1%) completed the questionnaire. Of the 4933 subjects who received the questionnaire in 1992 as well as in 2000 (*the follow-up group*), 4280 subjects (86.8%), of whom 1972 were men and 2308 were women responded at both occasions.

Prevalence of AR in 1992 and 2000

In 1992 and 2000, respectively, 20.5% and 25% responded yes to the question about self-reported AR. However, according to the *study definition* of AR, the prevalence of self-reported AR was 12.4% in 1992 and 15.0% in 2000. The increase in prevalence of AR between 1992 and 2000 was quite similar for both genders. The prevalence for men increased from 10.3% to 12.9%, and for women from 14.1% to 16.8%. The occurrence of the four different exposures (tree- and grass-pollen, furred animals and house dust, included in the study definition of AR, are shown in Table 1. There were statistically significant increases in nasal symptoms provoked by tree and grass pollen between 1992 and 2000, but not by furred animals and house dust.

Table 1. Occurrence in 1992 and 2000 of exposures associated with allergic rhinitis. Percentages and 95% confidence intervals

Provoking factor	1992			2000		
	All	Men	Women	All	Men	Women
Tree-pollen	6.8 (6.1–7.6)	5.7 (4.7–6.7)	7.8 (6.7–8.9)	10.3 (9.4–11.2)	7.9 (6.7–9.0)	12.4 (11.1–13.8)
Grass-pollen	9.4 (8.6–10.3)	8.3 (7.1–9.5)	10.4 (9.2–11.6)	12.5 (11.5–13.5)	11.2 (9.8–12.5)	13.6 (12.2–15.0)
Furred animals	5.7 (5.0–6.4)	3.9 (3.1–4.8)	7.2 (6.2–8.3)	6.3 (5.6–7.0)	4.7 (3.8–5.7)	7.6 (6.5–8.7)
House dust	7.6 (6.8–8.3)	6.1 (5.1–7.2)	8.8 (7.6–9.9)	8.8 (8.0–9.7)	7.7 (6.5–8.9)	9.8 (8.6–11.0)

Incidence of AR

The cumulative incidence of AR from 1992 to 2000 was 4.8% ($n = 164$), with a higher rate in women than men, 5.6% vs 3.9%, $P < 0.001$. The incidence rates in the four age groups are illustrated in Fig. 1. Figure 2A–D shows the cumulative incidence for each nasal-symptom provoking exposure. The highest incidence rate was observed in the youngest age group (8.7%) and there was a significant decrease with increasing age in both genders ($P < 0.01$). A tendency for decreasing incidence of AR with increasing age was seen for the provoking factors tree and grass pollen, but not for house dust and furred animals (Fig. 2A–D).

Remission from AR

The rate of remission from AR between 1992 and 2000 was 23.1% ($n = 122$), with numerically higher rate in women than in men, 24.8% vs 20.2% ($P = 0.24$). Remission in the four age groups is illustrated in Fig. 3. Figure 4A–D shows remission for each of the four exposure factors in each of the different age groups. In contrast to the incidence of AR, there was a tendency to a higher chance of remission in older age groups. This tendency was observed for tree- and grass pollen as provoking factors, but not for house dust and furred animals.

Logistic regression analyses of potential predictors for the incidence of AR

Several factors, reported in 1992, were associated with an increased risk for incident cases of AR between 1992 and 2000, among them report in 1992 of asthma symptoms during the last 12 months and a family history in 1992

either of AR, asthma, or allergic eczema (Table 2). Smoking habits were not associated with the incidence of AR.

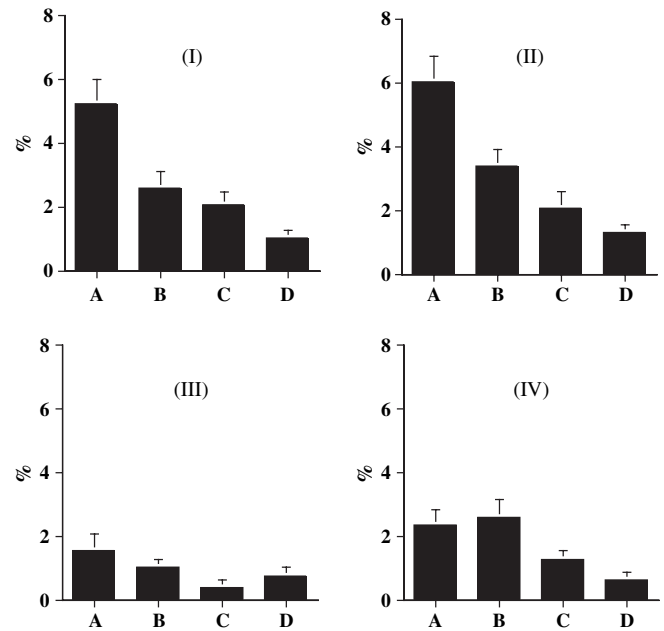


Figure 2. The cumulative incidence of self-reported allergic rhinitis for different provoking factors; tree- (I), grasspollen (II), furred animals (III) and house dust (IV) between 1992 and 2000 depicted as percentage of the population in 1992 for each age group. There is a trend for higher incidence in younger age groups for tree- and grasspollen but not for furred animals and house dust (ages in 1992). (A) 20–29 years; (B) 30–39 years; (C) 40–49 years; (D) 50–59 years.

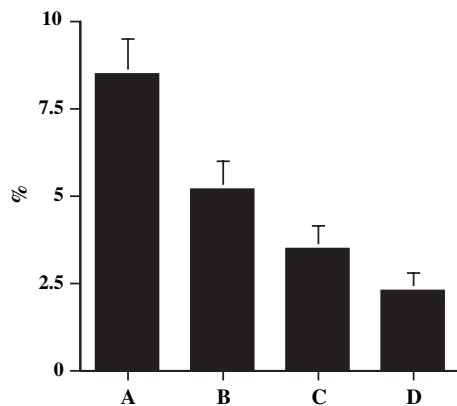


Figure 1. The cumulative incidence of self-reported allergic rhinitis symptoms between 1992 and 2000 depicted as percentage of the population in 1992 for each age group. There is a trend for higher incidence in younger age groups (ages in 1992). (A) 20–29 years; (B) 30–39 years; (C) 40–49 years; (D) 50–59 years.

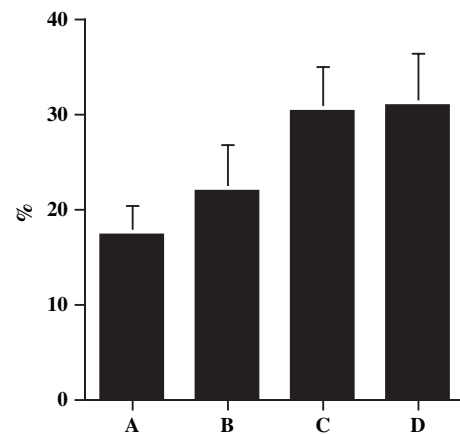


Figure 3. The remission of self-reported allergic rhinitis symptoms between 1992 and 2000 depicted as percentage of the population in 1992 for each age group. There is a trend for higher remission in older age groups (ages in 1992). (A) 20–29 years; (B) 30–39 years; (C) 40–49 years; (D) 50–59 years.

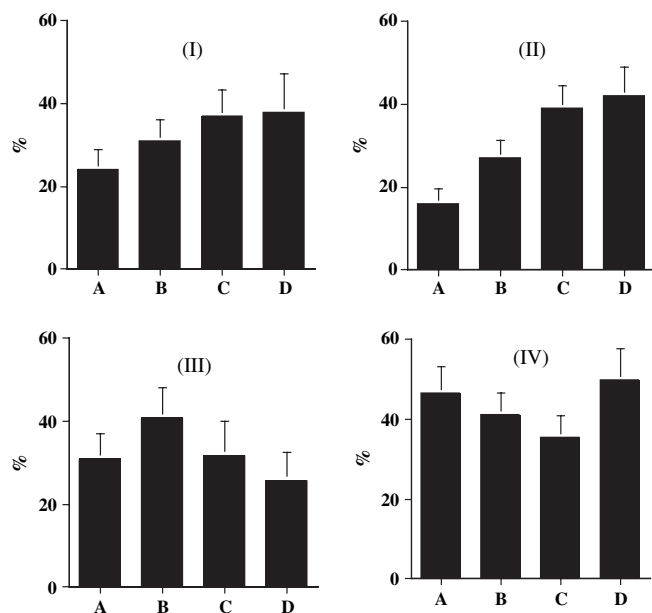


Figure 4. The remission of self-reported allergic rhinitis for different provoking factors; tree- (I), grasspollen (II), furred animals (III) and house dust (IV) between 1992 and 2000 depicted as percentage of the population in 1992 for each age group. There is a trend for higher remission in older age groups for tree- and grasspollen but not for furred animals and house dust (ages in 1992). (A) 20–29 years; (B) 30–39 years; (C) 40–49 years; (D) 50–59 years.

Table 2. Odds ratios (ORs) and 95% confidence intervals for incident cases as well as remission from allergic rhinitis caused by exposure to either, tree or grass pollen, furred animals or house dust, adjusted for influence of age and gender

Factors reported in the questionnaire 1992	Incidence of allergic rhinitis		Remission from allergic rhinitis	
	OR	95% CI	OR	95% CI
Family history of allergic rhinitis	1.99	1.42–2.80	1.23	0.81–1.87
Family history of asthma	1.62	1.10–2.37	0.94	0.60–1.48
Family history of allergic eczema	1.76	1.22–2.50	0.83	0.53–1.28
Self-reported allergic eczema	1.39	0.90–2.12	0.59	0.37–0.96
Asthma	1.36	0.58–3.18	0.85	0.47–1.52
Asthma symptoms during the last 12 months	1.89	1.08–3.31	0.52	0.31–0.87
Awakenings last 12 months due to cough/ breathlessness	1.67	1.12–2.48	0.81	0.50–1.29
Wheezing provoked by grass and/or tree pollen	2.16	0.91–5.17	0.59	0.38–0.92
Use of asthma medication	1.07	0.43–2.68	0.35	0.18–0.69
Daily use of an inhaled corticosteroid	1.05	0.54–2.07	1.00	0.72–1.37
Current smoker in 1992	0.81	0.57–1.14	1.02	0.66–1.58
Ex-smoker in 1992	1.20	0.82–1.75	1.17	0.72–1.90

Logistic regression analyses of potential predictors for the remission from AR

Report of asthma symptoms during the last 12 months, wheezing provoked by grass and/or tree pollen and use of

asthma medication (all reported in 1992), were factors associated with less chance of remission from AR (Table 2). Daily use of inhaled corticosteroids (ICS) was not a predictor of remission. Furthermore, there were no associations between remission from AR and a family history either of AR, asthma or allergic eczema. Self-reported eczema but not a physician's diagnosis of asthma was associated with less remission.

Discussion

This study in the same randomly selected adult population sample, comparing the results from two questionnaire surveys in 1992 and 2000 suggests that remission of AR is common with higher chance for remission by increasing age. In the study, 23.1% of subjects, aged 20–59 years, stated no remaining symptoms of AR after 8 years. An opposite age dependent trends was seen for the incidence of AR with the highest incidence in the youngest age group and the highest remission rate in the oldest age group.

In 2000, 25% responded yes to the question about self-reported AR. This figure is comparable with the prevalence of self-reported AR from other parts of Sweden (5) and Europe (6). However, when using a more strict definition, by including specific nasal provoking exposures (tree and grass pollen, furred animals and house dust) the prevalence was lower, 15%. This illustrates that the prevalence can differ depending on the study definition used. A Danish study by Linneberg et al. found that > 30% reported nasal symptoms in summer months and almost 34% were sensitized to any allergen (7). These higher figures may also be explained by the inclusion of a younger study population. In the present study, women had, similarly to other studies in adults (8), a higher prevalence of AR than men. The reason for this gender difference is not known. A conceivable factor could be that on group level, women seem to be more inclined than men to report respiratory symptoms (9, 10).

Asthma symptoms during the last 12 months including awakenings due to cough/breathlessness were associated with a higher incidence of AR, which further supports that asthma and AR is a pan-airway disease (11).

The 8 year remission rate of AR seems to be of the same order of magnitude that has been found in a couple of other studies. Bodtger et al. (12) found a remission rate of AR over an 8-year period of 17% in a study population consisting of slightly younger subjects than in our study, while Broder et al. (13) observed remission over a 4-year period of 10% among men and 5% among women. This gender difference is in contrast to our study where remission was numerically more frequent in women. We have not been able to find other studies, which have followed up a random population sample regarding AR. Others have found that just 1% of a small

selected group of patients with AR attending a hospital were free from AR over more than a 10-year period (14).

The present study supports that age is an important factor for both the risk for developing AR and the chance for remission. However, age dependent patterns for incidence and remission were only observed for AR related to the two seasonal allergens, tree- and grass pollen. Similar observations were made in the study of Broder et al. (13). They also found that older subjects were more likely to recover from AR and that this was particularly true for those without perennial nasal symptoms. Further evidence that AR symptoms have a higher chance to disappear at older age comes from a study which found that rhinitis tends to be milder with increasing age (15) and another study, which showed that skin test sensitivity decreased with increasing age (16). Furthermore, older age seems to be associated with a higher chance to recover from Japanese cedar pollinosis (17), which is associated with tree- and grass pollen. It could be speculated whether tree- and grass pollen more distinctly produces symptoms during a defined time-period of the year, whereas exposure to animals in sensitized individuals may change over the years. For instance, it seems likely that sensitized individuals try to get rid of their pets. Furthermore, symptoms produced by house dust mites are not as specific and often not as marked as AR due to pollen. Thus, these factors may explain difficulties in finding age-related incidence and remission for these perennial allergens.

Self-reported allergic eczema, asthma symptoms during the last 12 months, wheezing provoked by grass and/or tree pollen exposure and use of asthma medication did all predict less chance of remission from AR. These findings indicate that other manifestations of allergic disease reduce the remission chance from AR and also that current asthma is a predictor for less chance of remission of AR. This is in part also supported by the study by Ronmark et al. who found that remission of asthma was more frequent in subjects with milder asthma disease (18). The reason why a diagnosis of asthma did not predict less chance of remission could be explained by the fact that the question also covered asthma in the past, i.e. also from early childhood. In the study by Broder et al. (13) concomitant asthma had no effect on remission rate of AR. That study, however, was performed > 30 years ago

and the definition and awareness of asthma has changed since then. Moreover, asthma treatment has changed dramatically during this time period. Genetic risk factors are important risk factors for AR (19, 20). In line with this, the present study showed that a family history of asthma, AR, or allergic eczema predicted an increased incidence of AR. Conversely, none of these factors predicted less chance of remission, which could suggest that inherited allergic risk factors are less important for the remission of AR. Smoking habits was not associated with remission from AR, a result in agreement with Plaschke et al. (8). Moreover, report of use of ICS in 1992 was not associated with the chance for remission of AR.

The study results should be interpreted with some caution since they are based on self-reported symptoms only. Allergy testing to verify the diagnosis of AR would have been valuable but was not feasible. Anyway, we think that the symptom-based definition of AR used in the present study reflects a clinically relevant disease. One should also note that in real life far from all patients with AR are tested with, e.g. a skin prick test.

In conclusion, this questionnaire study of the same random adult population sample, the cumulative incidence of AR between 1992 and 2000 was about 5%. The study also indicated remission of AR in about one of five subjects within the 8-year period, particularly in older subjects. An opposite age dependent trend was found for the incidence of AR. These age dependent trends were observed for seasonal allergens (tree and grass pollen) only. The fact that asthma symptoms within the last 12 months in 1992 were associated with both increased incidence of AR and less chance for remission supports a strong relation between asthma and AR. Furthermore, the results suggest that hereditary allergic factors increase the risk for the development of AR, but that they may not be associated with the chance for remission. Further studies of factors associated with the incidence and remission of AR seem to be warranted.

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