

The incidence and familial occurrence of allergy

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Allergy questionnaires were given to 1,000 consecutive patients in a large medical clinic. An incidence of 19.8 per cent seasonal allergy was found in this survey. Only 34.3 per cent of the survey population gave no indication of past or present symptoms which might be allergic. Of the seasonal allergic patients, 82 per cent had hay fever, 16 per cent had hay fever and asthma, and 1.5 per cent had seasonal asthma. The allergic symptoms in relatives of patients with seasonal allergy varied with the patients' seasonal complaints. Forty-one per cent of patients with seasonal allergic rhinitis had relatives with hay fever, and 9 per cent had relatives with asthma or asthma and hay fever. Forty-four per cent of the near relatives of patients with both pollenosis and asthma had asthma, and 25 per cent had hay fever only. During the past 10 years, 37 per cent of the hay fever patients indicated improvement or disappearance of symptoms, and 45 per cent indicated that their symptoms were worse. Seventy-two per cent of patients with both asthma and hay fever indicated that symptoms improved or disappeared, but 6 per cent claimed increased symptoms. Fifteen per cent of the patients with seasonal allergy had no colds in a year compared to 32 per cent of the nonallergic patients. Seven per cent of seasonally allergic patients had three or more colds a year compared to 1.4 per cent of nonallergic patients.

Numerous surveys of the incidence of allergic symptoms in different population groups have been conducted in the past.¹⁻¹⁹ Many studies suffer from variation in the criteria for the diagnosis of atopic disease, variation in location and population group studied, and differences in the general awareness of atopic disease. The reported incidence has extended from Spain and Cooke's² 3.5 per cent to 58.9 per cent reported by Vaughan.³ A definite increase in the reported percentage of allergic persons can be noted in the surveys over the years. Investigations concerning the nature of inheritance in allergy have led to conflicting conclusions.^{15-17, 20-25} The problems inherent in evaluation of atopic heredity have been discussed.^{15, 26-28} Despite the number of studies, little has been written concerning the inheritance of specific allergic symptoms or the

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association between allergy and the common cold. It is generally believed that frequent upper respiratory infections may be an indication of an underlying allergic problem. The opposite association, of the susceptibility to the common cold in atopic persons when not having allergic manifestations, has not been investigated. An opportunity to conduct a survey, with questions relevant to these subjects, presented itself in a large community-oriented clinic in a suburban university town.

METHODS

An allergy questionnaire was given to over 1,000 consecutive adult patients who were seen at the Palo Alto Medical Clinic for a complete medical or annual physical examination. These patients were questioned as to past or present symptoms of allergic rhinitis, asthma, eczema, urticaria, food allergy, and nasal and eye symptoms, and whether these symptoms were seasonal or perennial. Symptoms were listed in groups as to whether they occurred over ten years ago, within the past ten years, or both, and as to whether they were slight, moderate, or severe. The result is the cumulative incidence of various symptoms. A history of allergic symptoms in the patients' families (parents, siblings, and children) was also obtained. The patients also estimated the average number of colds they had in a year. Relatively few questionnaires were considered unsatisfactory or not filled out. The total number of questionnaires used in this study was 1,000.

Other than in patients with seasonal symptoms, it is difficult to prove the presence of atopy in this survey. Although possible allergic patients were listed, the data from this group have questionable value in relation to atopy.

RESULTS

The patients answering the questionnaire were divided into four groups, as seen in Table I. These groups were listed as: seasonal allergy, nonseasonal respiratory symptoms, nonrespiratory symptoms, and nonallergic. In the survey, 19.8 per cent had definite seasonal asthma and/or allergic rhinitis and could be considered definitely atopic. Another 45.9 per cent were considered possibly allergic but lacked the definitive features of the patients with seasonal allergy. This group consisted of those patients listing nonseasonal nasal, eye, and asthma symptoms (37.1 per cent), and those listing eczema, hives, and food allergies (8.8 per cent). Only 34.3 per cent of the patients had no symptoms which might

Table I. *Incidence of allergy in 1,000 clinic patients*

	<i>Atopic patients with seasonal allergy</i>	<i>Possible allergic patients</i>		<i>Nonallergic patients</i>
		<i>Nonseasonal respiratory symptoms</i>	<i>Nonrespiratory symptoms</i>	
% of survey	19.8	37.1	8.8	34.3
% of patients having family history of asthma or hay fever	51.0	34.0	25.0	18.0

be considered allergic in nature. Also in Table I is the percentage of each group who have close relatives (parents, siblings, or children) with asthma and/or allergic rhinitis. This ranges from a 51 per cent family history in patients with seasonal allergy to an 18 per cent family history in patients with no allergy.

Of the 198 patients with seasonal allergy, 163 had seasonal allergic rhinitis, 32 had asthma and hay fever, and only 3 had seasonal asthma without hay fever (Table II). Forty-nine per cent of the seasonal hay fever patients had close family members with allergic symptoms. This percentage rises to 87 per cent in the patients with both seasonal hay fever and asthma, and to 100 per cent in the 3 patients claiming seasonal asthma only. (This last percentage lacks statistical significance because of the small sample.) Thus, seasonal asthma patients appear to have a higher prevalence of allergy in other family members than do seasonal allergic rhinitis patients.

The symptoms of the relatives of the patients with seasonal allergy vary with the patients' seasonal complaints (Table III). Forty-one per cent of patients with seasonally allergic rhinitis had relatives with the same affliction, in contrast to a family history of hay fever only in 25 per cent of patients having both pollenosis and asthma. By contrast, 9 per cent of pollenosis patients had relatives with asthma or hay fever and asthma, whereas 44 per cent of patients with both pollenosis and asthma had near relatives with asthma. Thus, atopic patients with

Table II. *Symptoms of seasonal allergic patients*

<i>Allergy</i>	<i>Questionnaire population (%)</i>	<i>Seasonal allergic patients (%)</i>	<i>Patients with family history of hay fever and asthma</i>		<i>Patients with no family history of hay fever and asthma</i>	
			<i>(%)</i>	<i>(No.)</i>	<i>(%)</i>	<i>(No.)</i>
Hay fever	16.3	82.0	49.0	80	51.0	83
Asthma and hay fever	3.2	16.0	87.0	25	13.0	7
Seasonal asthma	0.3	1.5	100.0	3	0.0	0

Table III. *Family histories of patients with seasonal allergy*

<i>Allergy</i>	<i>Family history</i>			
	<i>Hay fever (%)</i>	<i>Hay fever and asthma (%)</i>	<i>Asthma (%)</i>	<i>None (%)</i>
Seasonal hay fever	41 (94)*	2 (6)*	7 (16)*	49 (80)†
Seasonal hay fever and asthma	25 (12)*	34 (16)*	10 (7)*	13 (7)†
Seasonal asthma	50 (2)*	0 (0)	50 (2)*	0 (0)

*No. of relatives with specified allergic symptoms.

†No. of patients with no family history of allergy.

asthma had a high incidence of asthma in their relatives, and seasonal allergic rhinitis patients had a high incidence of relatives with hay fever, but few with asthma.

Table IV shows the breakdown of patients' symptoms in the group listed as nonseasonal respiratory complaints in Table I. Patients with nonseasonal nasal, eye, and asthmatic symptoms are listed in this group. The most frequent complaints refer to nasal and eye symptoms (333 patients, one third of all patients questioned, or 91 per cent of the nonseasonal respiratory group). As with the seasonally allergic patients, nonseasonal asthmatic patients had a high incidence of asthma in relatives, and nonseasonal rhinitis patients had more relatives with hay fever. Thirty-three per cent of the group with nonseasonal nasal and eye symptoms had relatives with allergy, in contrast to 55 per cent of those patients with both nonseasonal rhinitis and asthma, and to 22 per cent of patients with nonseasonal asthma. A higher percentage of the patients with nonseasonal nasal and eye complaints had relatives with allergic rhinitis only (21 per cent), com-

Table IV. *Symptoms and family histories of patients with nonseasonal respiratory and eye complaints*

<i>Symptoms</i>	<i>No. of patients</i>	<i>Family history</i>			
		<i>Hay fever (%)</i>	<i>Hay fever and asthma (%)</i>	<i>Eczema (%)</i>	<i>None (%)</i>
Nasal	217	21 (91)*	8 (35)*	4 (15)*	67 (231)*
Eye	37				
Nasal and eye	89				
Nasal and asthma	20	8 (3)*	39 (14)*	8 (3)*	45 (9)†
Asthma	14	3 (1)*	3 (1)*	6 (2)*	78 (11)†

*No. of relatives with specified allergic symptoms.

†No. of patients with no family history of allergy.

Table V. *Symptoms noted in patients with a history of eczema or urticaria*

<i>Allergy</i>	<i>No.</i>	<i>%</i>
<i>Eczema</i>		
With rhinitis	30	46
With asthma	4	7
With urticaria	10	15
Eczema only	21	32
Total no. patients	65	
<i>Urticaria</i>		
With rhinitis	61	52
With asthma	4	3
With eczema	10	8
Urticaria only	43	37
Total no. patients	118	

pared to 8 per cent of patients having both asthma and nonseasonal rhinitis. The proportion of the latter group of patients reporting relatives with asthma was much higher than that of the nonseasonal nasal and eye symptom patients (38 per cent compared to 8 per cent).

In this survey, 65 patients (6.5 per cent) listed eczema, and 118 patients (11.8 per cent) listed urticaria. Table V shows other possible allergic symptoms in these patients. Fifty-three per cent of the eczema patients and 55 per cent of the urticaria patients had rhinitis and/or asthma, which is similar to the percentage found in the total allergy survey (19.8 per cent atopic plus 37.1 per cent nonseasonal respiratory symptoms, or 56.9 per cent). Thirty-two per cent of the eczema patients and 37 per cent of the urticaria patients were free of other possible allergic complaints. Again this is similar to the 34.3 per cent nonallergic individuals in the whole survey. These percentages fail to show a significant difference in possible allergic respiratory complaints in eczema or urticaria patients when compared to the total survey population.

The allergic symptoms of the relatives of the 21 patients with eczema only and the 43 patients with urticaria only are shown in Table VI. The percentage of relatives having hay fever and/or asthma in patients with eczema only was similar to the 18 per cent positive family history for nonallergic subjects listed in Table I. Thus, patients listing eczema or urticaria as a sole allergic manifestation have a family history of pollenosis or asthma no different than that of nonallergic patients.

In contrast to the above groups, the patients with no allergic symptoms have a much smaller percentage of relatives with allergic complaints and a full 82 per cent had no near relatives with allergic symptoms (Table VII). Only 2 per cent

Table VI. *Symptoms in relatives of patients who have either eczema or urticaria as their only allergic manifestation*

<i>Allergy</i>	<i>Family history</i>		
	<i>Hay fever and/or asthma (%)</i>	<i>Eczema (%)</i>	<i>None (%)</i>
Eczema only	21 (11)*	17 (9)*	62 (14)†
Urticaria only	17 (15)*	6 (5)*	77 (33)†

*No. of relatives with specified allergic symptoms.

†No. of patients with no family history of allergy.

Table VII. *Symptoms in relatives of 343 patients who have no allergic manifestations*

<i>Family history</i>	<i>%</i>	<i>No. of relatives</i>
Hay fever	8	32
Hay fever and asthma	2	7
Asthma	6	24
Eczema	2	8
None	82	281*

*No. of patients with no family history of allergy.

of the nonallergic patients and 4.2 per cent of the clinic population had relatives with eczema, in contrast to 17 per cent of patients having eczema as their only complaint (Table VI). Therefore, it may be concluded that patients with eczema but no other allergic symptoms have a much higher percentage of relatives with the same skin disorder than is found in the general population.

On the questionnaire, patients indicated whether the symptoms occurred over ten years ago, within the last ten years, or both. The results are shown in Table VIII. Patients with pollenosis had about an equal chance of becoming either better or worse. The majority (72 per cent) of the patients having both seasonal allergic rhinitis and asthma showed a decrease or loss of symptoms during the past ten years. None of the 3 patients with seasonal asthma progressed to more severe asthma, and one had definitely improved. It appeared that patients with seasonal asthma or those with seasonal allergic rhinitis plus asthma had a much better chance than hay fever patients of expecting decreased symptoms with the passage of time. No information is available as to which of these patients had moved to California during the past ten years, and whether such a move modified the allergic symptoms.

Table IX shows the average number of colds per year in the four major groups of patients in Table I. The average dropped from 1.4 colds per year for the seasonally allergic patients to 1.1 colds per year for the nonallergic patients. Of greater significance is the difference between 15 per cent of patients with no colds in the seasonally allergic group and 32 per cent in the nonallergic patients. There is also a definite difference in the two groups as to the percentage with more than three colds a year (7 per cent opposed to 1.4 per cent). Thus, seasonally allergic patients appear to have more colds per year than do nonallergic patients.

Table VIII. *Changes in symptoms of patients with seasonal allergy*

<i>Allergy</i>	<i>Improved or disappeared</i>		<i>Worse</i>		<i>Unchanged</i>	
	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>
Hay fever	37	57	45	73	20	33
Asthma and hay fever	72	23	6	2	22	7
Asthma	33	1	0	0	67	2

Table IX. *Incidence of the common cold in 1,000 clinic patients*

	<i>Atopic patients with seasonal allergy</i>	<i>Possible allergic patients</i>		<i>Nonallergic patients</i>
		<i>Nonseasonal respiratory symptoms</i>	<i>Nonrespiratory symptoms</i>	
Average no. of colds per year	1.4	1.3	1.1	1.1
% of patients with no colds	15	21	27	32
% of patients with more than 3 colds per year	7	5.4	1.1	1.4

DISCUSSION

Studies of this type may be open to criticism because the patient alone indicated whether he had allergic symptoms. However, the conclusions are based on those patients with definite seasonal complaints, as these would be difficult to explain by other than allergic mechanisms. Surveys of allergic symptoms have showed an increase in the incidence of atopy over the years.^{18, 19} This is particularly true for seasonal allergy among college students^{2, 13-18} as well as other groups recently surveyed.^{8, 19} The high incidence of allergy in this study is in keeping with other recent studies. Of this clinic population, 19.8 per cent had definite seasonal allergic rhinitis and/or asthma. Further, 45.9 per cent of this population was considered possibly allergic. It can be seen that allergic symptomatology should not be considered an unusual entity.

A number of factors may contribute to this high incidence of allergy. First, this is a cumulative survey indicating past as well as present symptoms. Since this is an adult population with representatives in every decade of life, the incidence should be higher than in surveys of children or college students. Second, many of the patients in this study moved to this area from regions of the country where ragweed is prevalent; some moved to escape ragweed allergy. A recent survey²⁹ has shown asthma and hay fever to be most prevalent on the West Coast of the United States, and particularly in the San Francisco Bay area. The present study was made in a portion of the Bay area, which has an unusually heavy exposure to tree and grass pollens. A third reason is that the surveyed population comes from a university town with patients from the university faculty and student body, and from an electronics industry nearby. Other studies have shown a higher incidence of allergy in higher socioeconomic groups³⁰ and in groups with higher levels of education.¹³ A fourth reason is that minor degrees of symptoms were requested as well as moderate to marked symptomatology. Thus, 26 per cent of the patients with pollenosis listed their symptoms as slight; similar individuals may have been omitted from other studies.

The percentage of patients having close relatives with allergic symptoms is similar to that in other studies.^{1, 2, 24, 31, 32} Although the genetic mechanism of inheritance has not been defined, this survey supports the hereditary concept. The inheritance of specific allergic symptoms rather than the allergic diathesis has received little attention. By studying the patients with seasonal allergy, and thus choosing a group known to be atopic, the frequency of relatives with the same or other allergic symptoms was calculated. An impressive percentage of close relatives of atopic patients had similar allergic symptoms of either pollenosis or of asthma with pollenosis. Presence of asthma in addition to pollenosis or a family history of asthma did not increase with the intensity of the patients' symptoms. These data are consistent with the findings of Tips,¹⁶ who postulates that three distinct gene pairs govern the susceptibility of tissues to react to allergens—resulting in either pollenosis, asthma, or eczema. Rapaport²⁷ states, "It is agreed by most allergists that one inherits an allergic predisposition rather than a specific allergic disease." These data indicate that one inherits an allergic predisposition plus a tendency to react with a specific allergic disease.

The enhanced ability of specific tissues to react to various stimuli, including allergens, appears to be more common in certain families.

This survey failed to show an increase in other allergic symptoms in eczema or urticaria patients, or in their near relatives. This lack of correlation of increased respiratory allergy in eczema patients does not agree with other reports.^{33, 34} Several reasons may be given for this. The patients may have listed skin conditions other than infantile or atopic eczema under "eczema," and at the same time have been unaware of the presence of eczema when they were children. Despite these possibilities, when compared to the whole survey group, there is a significantly increased proportion of patients with eczema only, who have relatives with eczema. From the data presented, eczema appears to be an inherited condition separate from seasonal hay fever and asthma.

Urticaria may be found in many nonallergic individuals due to a variety of mechanisms. It has been stated³⁵ that urticaria is more common since the use of penicillin, and this increased frequency may be harder to correlate with other allergic symptoms. In this study, atopic individuals had no higher incidence of urticaria than the survey group.

The natural history of allergic patients has been studied extensively by Rackemann.^{36, 37} In general, he concludes that allergic symptoms decrease with age. The present study shows that the intensity of seasonal symptoms in patients with the combination of pollenosis and asthma tends to decrease with time. The same conclusion was not evident in those patients having seasonal allergic rhinitis only. Of interest is the finding that only four patients with seasonal allergic rhinitis as their sole manifestation of allergy over ten years ago had developed chronic asthmatic symptoms in the last ten years. Other studies^{36, 38} agree that this is an infrequent pattern of disease evolution. In general, most atopic patients' symptoms changed in intensity with time but rarely varied in type.

The interplay between allergy and infection has been referred to in several publications.³⁹⁻⁴² Most studies suggest that infection contributes to or causes allergic symptoms in certain cases, particularly in asthma. Respiratory infections appear to be more prevalent in chronic allergic states.⁴³⁻⁴⁶ Nothing has been written about the prevalence of the common cold in persons having only seasonal allergic complaints. This study indicates that the group with seasonal allergy includes a higher percentage of persons with frequent colds and a smaller percentage of persons with no colds, than does the nonallergic group. Most seasonal allergy is in the spring and summer, whereas most colds are in the winter. This information is consistent with the concept that the nasal mucous membrane in seasonally allergic individuals is more susceptible to the common cold than the membrane of nonatopic persons, even when allergic symptoms are not present.

The study of Salvaggio and co-workers,⁴⁷ showing the greater ease of induction of sensitivity to unusual antigens applied to nasal membranes of atopic individuals compared to those of nonallergic individuals, indicates another difference in the nasal membranes. As mentioned earlier in this paper, the inheritance of pollenosis appears to be different than pollenosis associated with asthma. It would appear that further studies of variations from the normal in the target

organs (nasal mucous membrane or bronchial tree) in selected allergic patients would be of value.

CONCLUSIONS

1. An incidence of 19.8 per cent seasonal allergy was found in this survey. Only 34.3 per cent of the survey population could be considered nonallergic. Thus, allergic symptomatology is not an unusual finding.

2. Persons having seasonal allergic rhinitis had a high percentage of close relatives with the same complaint. In comparison, persons having both seasonal allergic rhinitis and asthma had a significantly higher percentage of relatives with allergic complaints, particularly asthma.

3. Seasonal allergic rhinitis patients showed both improvement and worsening of symptoms with similar frequency over a period of time. Most patients with seasonal allergic rhinitis and asthma improved with time. Seasonal allergic rhinitis rarely progressed to chronic asthma.

4. Persons with seasonal allergy had a greater tendency to develop frequent colds, and a smaller percentage of them had no colds per year when compared to nonallergic individuals.

5. The data suggest that in seasonally allergic patients, inherited variations from the normal in different areas of the respiratory tract (nasal mucosa or bronchial tree) may contribute to the symptomatology.

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