

Hay fever, eczema and urticaria in southwest Norway

Lifetime prevalences and association with sex, age, smoking habits, occupational airborne exposures and respiratory symptoms

P. BAKKE,¹ A. GULSVIK¹ & G. E. EIDE²

¹Department of Thoracic Medicine and ²Section for Medical Informatics and Statistics, University of Bergen, Norway

Information on hay fever, eczema, urticaria, respiratory symptoms, smoking habits and occupational dust or gas exposure was obtained by a self-administered questionnaire from a random sample of 4992 subjects of the general population aged 15–70 years of the Hordaland county, Norway. The response rate was 90% of the sample. The lifetime prevalences of hay fever, eczema and urticaria were 10%, 25% and 9% of the respondents, respectively. Eczema and urticaria were more often reported by women than by men. The lifetime prevalence of hay fever decreased substantially by age in both sexes. A history of hay fever was inversely related to cigarette smoking. The lifetime prevalences of eczema and urticaria were associated with occupational dust or gas exposure after adjusting for sex, age, smoking habits and area of residence. Adjusted odds ratios of respiratory symptoms in subjects with hay fever were almost 2.0 compared with those without.

Key words: eczema; hay fever; occupational dust or gas exposure; population survey; respiratory symptoms; urticaria.

Accepted for publication 19 April 1990

The prevalences of various allergic diseases have been studied in selected age groups (15, 19, 20, 22, 25, 27, 35) or working populations (21). The frequency of these diseases has also been examined by consultation rates in general practice (2, 23) and specialist practice (34). Differences in survey populations, methods of collection data and definitions applied to determine allergic diseases make comparison of data difficult and may account for the great variations in results between various studies.

Assessments of prevalences of allergic diseases from general population surveys are few (5, 17, 30), and limited data (25, 27) are available for the Norwegian population. Epi-

demiological studies of possible risk factors for allergy are a prerequisite to design programmes for prevention.

The objectives of the present study were 1) to examine the reproducibility of self-reported diagnoses of hay fever, eczema and urticaria and to compare the self-reported diagnoses with a physician's diagnoses based on a clinical examination, 2) to examine the lifetime prevalences of hay fever, eczema and urticaria in the community and to assess some possible environmental factors related to the occurrence of the diseases, and 3) to examine the relationship between lifetime prevalences of these diseases and the prevalences of respiratory symptoms.

MATERIAL AND METHODS

Study population

The survey was a two-phased cross sectional study. The survey population comprised all persons between 15 and 70 years and included 267 304 subjects per 31 December 1984 in the county of Hordaland on the southwest coast of Norway. Bergen is the only urban municipality with just above half the population of the county. In the first phase conducted from September to December 1985, a random sample of 4992 persons of the survey population was mailed a questionnaire on hay fever, eczema, urticaria, respiratory symptoms, smoking habits and occupational dust or gas exposure including asbestos and quartz. The response rate was 90% of the sample. In the second phase a random subsample of 595 subjects of those responding in the first phase and living in Bergen and 11 surrounding municipalities, were invited to a clinical examination on the presence of hay fever, eczema and urticaria. Altogether 512 subjects (86% of those invited) attended the second phase which took part from April 1987 to July 1988.

Questionnaire

The mail questionnaire contained four questions regarding allergic diseases: Have you ever had one of the diseases mentioned below: eczema, urticaria or hay fever? Have you ever been allergy tested by a practitioner or in hospital? The recipients were asked to pick one of the preprinted answers: yes, no and do not know. The wording of the questions on the respiratory symptoms applied in the present analysis, were: Do you usually cough or clear your throat in the morning? Do you have cough for 3 months or more altogether during a year? Do you have phlegm when coughing? Are you breathless when you climb two flights of stairs at an ordinary pace? (breathlessness grade 2), Do you ever have wheezing in your chest? The preprinted answers were yes and no.

Subjects were classified as non-smokers if they had never smoked daily (4). Ex-smokers were those who had been smoking daily and given it up prior to the survey. Smokers were those who smoked daily at the time of the study. Previous Norwegian surveys have validated the questions on respiratory symptoms (14), smoking habits (13) and asbestos exposure (18).

In the second phase the subjects were asked to fill out identical questions on hay fever, eczema, urticaria and allergy testing once again. To adjust for new events which might have occurred between the first and second completion of the questions, those who gave a positive answer, were asked if they had had the disease before the autumn of 1985. The subjects were then interviewed and examined by a physician (P.B.). He did not know the subject's answers to the questionnaire and the subjects did not know that they would be examined on these diseases when completing the questionnaire. In each individual the physician gave a diagnosis as to whether the subject had ever had seasonal or perennial rhinitis, atopic dermatitis, urticaria or had been allergy tested.

Physician diagnosis

Atopic dermatitis was diagnosed by the physician if three of the following four major criteria of Hanifin & Rajka (16) were fulfilled: pruritus, lichenification, chronically relapsing course, and a personal or family history of atopy. Urticaria was defined as a periodic, localized pruritic oedema of the skin (15). Seasonal or perennial rhinitis were defined according to the criteria of World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians (32) requiring three of the following symptoms: sneezing, nasal obstruction, clear nasal discharge, watering eyes. Seasonal rhinitis was diagnosed if the symptoms appeared in the pollen season, perennial rhinitis if the symptoms were non-seasonal and associated with a known or strongly suspected allergen. Allergy testing required that the subjects had previously been examined with skin testing, blood sampling of IgE antibodies

or specific nasal, conjunctival or bronchial provocation testing.

Statistics

The reproducibility of the answers to the questionnaire is expressed using the kappa index (12). The comparison of the diagnoses of the questionnaire and the physician is expressed as sensitivity, specificity, predictive values and likelihood ratio of each variable. The likelihood ratio of a test is the ratio between the probability that a person with a disease has a positive test and the probability that a person without the disease has a positive test. The likelihood ratio unlike the predictive values is not dependent on the prevalence of the disease (24).

Contingency tables were analysed for statistical significance using chi-square tests, or for stratified data, the Mantel-Haenszel extension of the test (1). Multiple logistic regression analysis (11) was applied to evaluate the influence of potential risk factors to hay fever, eczema, and urticaria. As independent variables were used sex, age, smoking habits, urban-rural area of residence and occupational dust or gas exposure. Occupational dust or gas exposure was used as a dichotomous variable and as a categorical variable divided into asbestos exposure, quartz exposure and other dust or gas exposure. Each logistic regression analysis started with all the independent variables in the model. Only significant variables were kept in the final model. The entry and exit level were set at $P = 0.01$. The relationships of hay fever, eczema and urticaria to respiratory symptoms were also evaluated in logistic regression analyses.

RESULTS

Altogether 93 % of the respondents to the questionnaire gave an unambiguous, i.e. "yes" or "no" answer to the questions on hay fever, eczema, and urticaria. Rates of unambiguous answers did not differ between the sexes and among the age groups. Unambiguous answers to the question on allergy testing were given by 99 % of the respondents. No difference regarding prevalences of allergic disease and allergy testing were observed between attendants and non-attendants to the second phase. The agreement between the self-reported diagnoses and the physician's diagnoses was higher for hay fever than for eczema and urticaria (Table 1). When hay fever was defined as a seasonal disease, the consistency between the self-reported and the physician's diagnosis was higher than when hay fever was defined as a perennial disease. The likelihood ratio of seasonal rhinitis was 12.3 compared with 2.2 for perennial rhinitis. The information on allergy testing was mostly confirmed by the physician. The reproducibility of answers given 2 years apart, was higher for allergy testing and hay fever than for eczema and urticaria (Table 2).

Allergy testing by practitioners or in hospital had been performed in 11 % of the respondents. The rate of allergy tested persons was higher ($P < 0.01$) in urban (13 %) than in rural areas (9 %). More women (13 %) than men (9 %) reported that they had been allergy tested ($P < 0.01$). Of those who had had hay fever, eczema or urticaria 37 %, 22 % and 15 %, respectively, reported that they had been allergy tested.

The overall lifetime prevalence of eczema was 25 % of the respondents (Table 3). Eczema was

Table 1

Validity of answers to a self-administered questionnaire on hay fever, eczema, urticaria and allergy testing in a Norwegian general population. Based on a physician's clinical examination of 512 subjects

Self-reported diagnosis/test	Sensitivity %	Specificity %	Likelihood ratio %	Predictive value	
				Positive %	Negative %
Hay fever	67	95	13.4	89	95
Eczema	85	78	3.9	51	98
Urticaria	66	87	4.8	95	86
Allergy testing	90	90	9.2	82	99

Table 2

Reproducibility of answers to a self-administered questionnaire on hay fever, eczema, urticaria and allergy testing, given in 1985 and in 1987/88 to 512 subjects randomly selected from a Norwegian general population

Diagnosis/test	Kappa	SE
Hay fever	0.71	0.04
Eczema	0.55	0.03
Urticaria	0.66	0.04
Allergy testing	0.76	0.04

1.5 times more common in women than in men after adjusting for age ($P < 0.001$). A decline in lifetime prevalence of eczema with age was found in women ($P < 0.01$), whereas no such trend was observed in men. Urticaria was reported by 9 % of the respondents (Table 3) and hay fever was reported by 10 % of the respondents (Table 4). No difference was observed between the sexes regarding this disease. A substantial decrease in lifetime prevalence with age was noted in men ($P < 0.001$) and in women ($P < 0.01$). The lifetime prevalence of hay fever was inversely related to cigarette smoking (Table 4). The higher the cigarette consumption the lower the odds for ever having had hay fever (Table 5). No differences in lifetime prevalences of hay fever, eczema and urticaria were found between urban and rural areas.

Occupational exposure to dust or gas was significantly associated with lifetime prevalences of eczema and urticaria (Table 5) after adjusting for age, sex, smoking habits and area of residence. There was also an association of eczema

to asbestos exposure (adjusted odds ratio: 1.9, $P < 0.01$) and quartz exposure (adjusted odds ratio: 2.3, $P < 0.01$), and of urticaria to quartz exposure (adjusted odds ratio: 2.1, $P < 0.01$). However, no dose-response relationship between asbestos and quartz on one side, and the skin disorders on the other was found, either regarding duration or degree of exposure.

Hay fever and eczema were associated with all the respiratory symptoms after adjusting for sex, age, smoking habits and occupational dust or gas exposure (Table 6). Hay fever interacted with smoking in the association with wheezing. The higher the cigarette consumption the lower the adjusted odds ratios for wheezing in subjects with hay fever compared with those without. Urticaria varied with chronic cough and wheezing.

DISCUSSION

A self-administered questionnaire is an inexpensive method of examining a population sample. No interviewers can bias the results. The clinical manifestations may, however, vary greatly behind self-reported diagnoses of eczema, urticaria and hay fever. The present survey yielded good agreement between self-reported diagnosis of ever having had hay fever and a diagnosis based on a physician's clinical examination. A positive answer to a question on hay fever had a predictive value of 67 % in a Danish general population (31). Eczema had an adequate sensitivity, but a poor specificity, indicating that people tend to include other skin diagnosis in the meaning of eczema. An overestimation of

Table 3

Lifetime prevalence of eczema and urticaria by sex and age in the general population of Hordaland county, Norway 1985. ($n = 4469$)

Age (years)	Women <i>n</i>	Men <i>n</i>	Eczema		Urticaria	
			Women %	Men %	Women %	Men %
15-19	243	253	26	18	7	7
20-29	482	518	38	25	12	7
30-39	461	497	36	21	11	9
40-49	362	327	30	17	11	6
50-59	311	290	24	20	13	6
60-69	326	287	21	18	10	5
15-70	2249	2220	30	20	11	7

20 % has been observed for a positive answer to infantile eczema (26).

The reproducibility expressed as the kappa index is biased by the prevalence of the disease examined (12). Given that the lifetime prevalence of eczema was equal to that of hay fever and urticaria, the kappa index for eczema would be 0.65. Thus, after adjusting for the occurrence of the disease, the reproducibility of the information on eczema and urticaria still tended to be poorer than for hay fever.

One would expect that the lifetime prevalence of a disease increases by age as new cases in adult life accumulate with cases in childhood. No rise in the lifetime prevalences of either disease was observed. The unchanged occurrence of urticaria by age indicates that the numbers of new cases and drop outs (migration, death, etc.) are identical. Another possible explanation is that the diseases disappear in the elderly, and that older people tend to forget that they have had eczema and urticaria earlier in life. A Danish survey of 2000 adults (30) also failed to show an increase in lifetime prevalences of eczema and urticaria with age.

The lifetime prevalence of hay fever declined by age. This may also indicate that the incidence of the disease increases in younger people. In England and Wales the number of patients consulting general practice for hay fever has almost doubled from 1970–1 to 1981–2 (2). The magnitude of the increase and its uniformity in both sexes and all ages make the authors conclude that it represents a true increase in prevalence and is not accounted for by

changes in diagnostic preference. In Sweden the prevalence of allergic rhinitis in conscripts has increased from 4.4 % in 1971 to 8.4 % in 1981 (35).

As in our study, an interview investigation of a representative sample of the adult Danish population found eczema and urticaria to be almost twice as prevalent in women as in men (30). Women are more exposed to cosmetics than men, and they more commonly hold occupations (hair dressers, cleaners) in which skin disorders are frequently seen (9). Another explanation for the sex difference could be that women are more concerned about their skin and are more ready to report skin disorders than men. However, no difference between the sexes was found in sensitivity and specificity of the questions on eczema and urticaria.

In Denmark (31) and in Sweden (35) hay fever is more prevalent in urban than in rural areas. No urban-rural differences in lifetime prevalences of eczema, urticaria and hay fever were observed in the present study. Bergen covers large rural areas in which half the population of the municipality lives. This could have obscured any urban-rural difference.

There was an inverse association between cigarette smoking and lifetime prevalence of hay fever. A similar relationship has previously been noted between smoking habits and allergy skin test reactions (6). One explanation for the lower rate of smoking in subjects with hay fever may be health selection. Subjects with hay fever do not take up smoking and if they do, their tendency to quit smoking is higher than in subjects

Table 4

Lifetime prevalence of hay fever by age and smoking habits in the general population of Hordaland county, Norway 1985

Age (years)	Non-smokers		Ex-smokers		Smokers		Total*	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
15–19	46	15	5	6	13	9	65	13
20–29	63	16	19	14	52	11	136	14
30–39	35	11	28	14	39	9	103	11
40–49	31	13	19	11	8	3	60	9
50–59	24	10	7	5	11	5	42	7
60–69	19	7	6	4	5	3	31	5
15–70	222	12	84	10	129	7	442	10

*Smoking habits were unknown in 7 subjects. They are included under total.

Table 5

Adjusted odds ratios (OR) with 95 % confidence intervals (95 % CI) for ever having had hay fever, eczema and urticaria by sex, age, smoking habits, occupational exposure and area of residence

Independent variables	Values	Number of subjects	Hay fever		Eczema		Urticaria	
			OR	(95 % CI)	OR	(95 % CI)	OR	(95 % CI)
Sex	men	2119	1		1		1	
	women	2151	1.1	(0.9–1.3)	2.1	(1.8–2.5)	1.9	(1.5–2.4)
Age	X		1		1		1	
	X + 10 years		0.8	(0.7–0.8)	0.9	(0.8–0.9)	1.0	(0.9–1.0)
Smoking habits	non-smokers	1819	1		1		1	
	ex-smokers	882	0.9	(0.7–1.2)	1.2	(0.9–1.4)	1.2	(1.0–1.6)
	smokers 1–9*	320	0.8	(0.5–1.2)	1.0	(0.8–1.3)	1.4	(1.0–1.9)
	10–19*	880	0.6	(0.4–0.8)	1.0	(0.9–1.2)	1.0	(0.8–1.3)
	25 + *	369	0.5	(0.3–0.7)	1.3	(0.9–1.7)	0.8	(0.6–1.3)
Occupational dust or gas exposure	no	3031	1		1		1	
	yes	1239	1.2	(0.9–1.5)	2.0	(1.7–2.3)	1.4	(1.1–1.9)
Area of residence	urban	2246	1		1		1	
	rural	2024	1.0	(0.8–1.3)	0.9	(0.8–1.0)	0.9	(0.8–1.2)

*Cigarettes per day
199 subjects were excluded from the analyses due to missing data on one or more of the independent variables.

without hay fever. This should have led to a higher percentage of subjects with hay fever among ex-smokers, but this we did not find. Further, Burrows et al. (7) found that total serum IgE increased in non-smokers, but not in smokers during spring time. This finding suggests that smoking does not appear to promote sensitisation to common aero-allergens. In contrast, studies of occupational groups indicate that smokers develop allergic reactions to airborne pullutants more often than non-smokers (29, 33). One may speculate that the IgE antibodies of smokers are qualitatively different from those of non-smokers and thereby lead to a

Table 6

Adjusted odds ratios* (OR) with 95 % confidence intervals (95 % CI) for respiratory symptoms in subjects with hay fever, eczema and urticaria compared to those without

Symptoms	Hay fever		Eczema		Urticaria	
	OR	(95 % CI)	OR	(95 % CI)	OR	(95 % CI)
Morning cough	1.9	(1.5–2.4)	1.4	(1.2–1.7)	1.3	(0.9–1.7)
Chronic cough	1.8	(1.3–2.4)	1.6	(1.3–1.9)	1.5	(1.1–3.0)
Phlegm when coughing	1.7	(1.4–2.2)	1.5	(1.2–1.9)	1.1	(0.7–1.6)
Breathlessness grade 2	1.7	(1.3–2.4)	1.5	(1.2–1.8)	1.3	(0.9–1.8)
Wheezing			1.7	(1.4–2.0)	1.6	(1.3–2.1)
Given non-smokers	4.4	(3.1–6.4)				
Given ex-smokers	2.4	(1.1–4.0)				
Given smokers	1.4	(0.8–2.3)				

*Adjusted for sex, age and smoking habits and occupational dust or gas exposure.

reduced immune response to inhaled allergens. Only a follow-up study of a general population sample from childhood to adolescence observing the development of smoking habits, total serum IgE and hay fever may bring light on the causal relationship between smoking habits and allergic rhinitis.

A study of 9017 Finnish farmers showed that subjects with self-reported past or present atopic eczema, hay fever or other allergic rhinitis had higher prevalence of chronic bronchitis than those without eczema and rhinitis (28). These associations may have been confounded by organic dust exposure which may cause both atopic and respiratory disorders. However, we have confirmed the association of hay fever, eczema and urticaria to respiratory symptoms in a general population sample. The relationship is thus also observed in persons with non-farming occupations. One could argue that symptoms of hay fever might have been confused with symptoms of the lower airways (cough, phlegm, breathlessness). However, the questionnaire survey was conducted between September and December, whereas the hay fever season in Norway is from April to July making this bias not likely.

We observed an association of dust or gas exposure to eczema and urticaria. Selected groups of patients have previously been identified in whom contact with aero-allergens may cause flares of their atopic dermatitis (3, 8). Our lack of a dose-response relationship between asbestos and quartz, and the skin disorders may indicate that there is no causal association between the mineral fibers and the skin disorders. Asbestos and quartz exposure may only be indicators of an unhealthy working environment. Chromate, solvents and diesel fuels may cause dermatitis, and they are frequently used by asbestos-exposed workers, i.e. plumbers, mechanics and ship mechanics. (10).

ACKNOWLEDGEMENTS

This study was funded by the Royal Norwegian Council for Scientific and Industrial Research, the Norwegian Research Council for Science and the Humanities, and the Norwegian Asthma and Allergy Association. The Central Bureau of Statistics of Norway offered excellent technical assistance

during the mail inquiry. Valborg Baste is thanked for her aid with the statistical analysis.

REFERENCES

1. Armitage, P. & Berry, G.: Statistical methods in medical research. Blackwell Scientific, Oxford, 1987.
2. Ayres, J. G.: Trends in asthma and hay fever in general practice in the United Kingdom 1976-83. *Thorax* 41, 111-116, 1986.
3. Beck, H-I. & Korsgaard, J.: Atopic dermatitis and house dust mites. *Br. J. Dermatol.* 120, 245-251, 1989.
4. Bjartveit, K., Foss, O. P. & Gjervig, T.: The cardiovascular disease study in Norwegian counties. *Acta. Med. Scand. (Suppl 675)*, 1-184, 1983.
5. Broder, I., Barlow, P. P. & Horton, R. J. M.: The epidemiology of asthma and hay fever in a total community, Tecumseh, Michigan. *J. Allergy* 33, 513-523, 1962.
6. Burrows, B., Lebowitz, M. D. & Barbee, R. A.: Respiratory disorders and allergy skin-test reactions. *Ann. Intern. Med.* 84, 134-139, 1976.
7. Burrows, B., Halonen, M. & Barbee, R. A.: Respiratory disorders and relationship of serum immunoglobulin E to cigarette smoking. *Am. Rev. Respir. Dis.* 124, 523-525, 1981.
8. Clark, R. A. F. & Adinoff, A. D.: Aeroallergen contact can exacerbate atopic dermatitis: patch tests as a diagnostic tool. *J. Am. Acad. Dermatol.* 21, 863-869, 1989.
9. Cronin, E.: Contact dermatitis, pp. 24-26. Churchill Livingstone, Edinburgh, 1980.
10. Cronin, E.: Contact dermatitis, pp. 879-894, Churchill Livingstone, Edinburgh, 1980.
11. Dixon, J. W. (ed.): BMDP statistical software manual. Berkeley, California: University of California Press, 1985.
12. Feinstein, A.: Clinical epidemiology. W. B. Saunders, Philadelphia, 1985.
13. Foss, O. P. & Lund-Larsen, P. G.: Serum thiocyanate and smoking: interpretation of serum thiocyanate levels observed in a large health study. *Scand. J. Clin. Lab. Invest.* 46, 245-251, 1986.
14. Gulsvik, A.: Prevalence of respiratory symptoms in the city of Oslo. *Scand. J. Respir. Dis.* 60, 275-285, 1979.
15. Haahtela, T., Heiskala, M. & Souniemi, I.: Allergic disorders and immediate skin test reactivity in Finnish adolescents. *Allergy* 35, 433-441, 1980.
16. Hanifin, J. M. Rajka, G.: Diagnostic features of atopic dermatitis. *Acta Derm. Venerol (Stockh.)* 92, Suppl., 44-47, 1980.
17. Hellgren, L.: The prevalence of urticaria in the total population. *Acta Allergol.* 27, 236-240, 1972.
18. Hilt, B., Langård, S., Lund-Larsen, P. G. & Lien, J. T.: Previous asbestos exposure and smoking habits in the county of Telemark, Norway - a cross-sectional study. *Scand. J. Work Environ. Health*, 12, 561-566, 1986.
19. Holmgren, D., Åberg, N., Lindberg, U. & Engström, I.: Childhood asthma in a rural county. *Allergy* 44, 256-259, 1989.

20. Kjellman, N.-I. M.: Atopic disease in seven year-old-children. *Acta Paediatr. Scand.* 66, 465-471, 1977.
21. Lammintausta, K., Kalimo, K. & Havu, V. K.: Occurrence of contact allergy and hand eczemas in hospital wet work. *Contact Dermatitis* 8, 84-90, 1982.
22. Louma, R. & Koivikko, A.: Occurrence of atopic diseases in three generations. *Scand. J. Soc. Med.* 10, 49-56, 1982.
23. Pedersen, P. A. & Weeke, E. R.: Allergic rhinitis in Danish general practice. *Allergy* 36, 375-379, 1981.
24. Radack, K. L., Rouan, G. & Hedges, J.: The likelihood ratio. An improved measure for reporting and evaluating diagnostic test results. *Arch. Pathol. Lab. Med.* 110, 689-693, 1986.
25. Robberstad, T.: Allergic diseases in children. In Norwegian, English abstract. *Tidskr. Nor. Lægeforen.* 11, 572-574, 1978.
26. Schultz-Larsen, F., Holm, N. V. & Henningsen, K.: Atopic dermatitis. A genetic-epidemiologic study in a population based twin sample. *J. Am. Acad. Dermatol.* 15, 487-494, 1986.
27. Skarpaas, I. J. K. & Gulsvik A.: Prevalence of bronchial asthma and respiratory symptoms in school children in Oslo. *Allergy* 40, 295-299, 1985.
28. Terho, E. O., Husman, K., Vohlonen, I. & Heinonen, O.: Atopy, smoking, and chronic bronchitis. *J. Epidemiol. Community. Health* 41, 300-305, 1987.
29. Venables, K. M., Topping, M. D., Howe, W., Luczynska, C. M., Hawkins, R. & Newman Taylor, A. J.: Interaction of smoking and atopy in producing specific IgE antibody against a hapten protein conjugate. *Br. Med. J.* 290, 201-204, 1985.
30. Weeke, E. R., Kamper-Jørgensen, F. & Pedersen, P. A.: Incidences of nettle-rash and hypersensitivity eczema in the adult Danish population. In Danish, English abstract. *Ugeskr. Læger* 142, 3340-3343, 1980.
31. Weeke, E. R.: Epidemiology of hay fever and perennial allergic rhinitis. In Schlumberger, H. D. (ed.): *Epidemiology of allergic diseases*, pp. 1-20, Karger, Basel, 1987.
32. World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians.: *International classification of health problems in primary care*. Oxford University Press, Oxford, 1983.
33. Zetterström, O., Osterman, K., Machado, L. & Johansson, S. G. O.: Another smoking hazard: raised serum IgE concentration and increased risk of occupational allergy. *Br. Med. J.* 283, 1215-1217, 1981.
34. Østerballe, O., Dirksen, A., Weeke, B. & Weeke, E. R.: Cutaneous allergy in a Danish multi-centre study. In Danish, English abstract. *Ugeskr. Læger* 143, 3211-3218, 1981.
35. Åberg, N.: Asthma and allergic rhinitis in Swedish conscripts. *Clin. Exp. Allergy* 19, 59-63, 1989.

Address

Per Bakke

Department of Thoracic Medicine

N-5021 Haukeland Hospital

Norway

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.