

Prevalence of nasal symptoms and their relation to self-reported asthma and chronic bronchitis/emphysema

P. Montnémary*, C. Svensson#, E. Ädelroth[¶], C-G. Löfdahl⁺, M. Andersson#,
L. Greiff#, C.G.A. Persson[§]

Prevalence of nasal symptoms and their relation to self-reported asthma and chronic bronchitis/emphysema. P. Montnémary, C. Svensson, E. Ädelroth, C-G. Löfdahl, M. Andersson, L. Greiff, C.G.A. Persson. ©ERS Journals Ltd 2001.

ABSTRACT: Little information is available on associations between rhinitis and chronic bronchitis/emphysema (CBE).

Self-reported upper airway symptoms, asthma, and CBE were examined in 12,079 adults living in southern Sweden.

The response rate was 70% (n=8,469), of whom 33% reported significant nasal symptoms: a blocked nose was reported by 21%; sneezing by 18%; nasal discharge by 17%; and thick yellow nasal discharge by 5.7%. Nasal symptoms and combined nasal and self-reported bronchial disease were generally more common among smokers than nonsmokers. There was little overlap between asthma and CBE, but 46% of those with asthma and 40% of those with CBE had significant nasal symptoms. Best predicting factors (odds ratios >3) for asthma and CBE were nasal symptoms due to exposure to animals and damp/cold air, respectively.

One-third of an adult, southern Swedish population, had significant allergic and/or nonallergic nasal symptoms. Nasal symptoms were frequently found to coexist with both asthma and chronic bronchitis/emphysema, suggesting that pan-airway engagement is common in both diseases. Differing associations between types of nasal symptoms and allergic and irritant triggers of nasal symptoms, with regard to asthma and chronic bronchitis/emphysema, emphasize the different natures of these bronchial diseases.

Eur Respir J 2001; 17: 596–603.

*Dept of Community Health Sciences, #Dept of Otorhinolaryngology, [¶]Dept of Respiratory Medicine and Allergy, Umeå University, Sweden. ⁺Dept of Respiratory Medicine, and [§]Dept of Clinical Pharmacology, Lund University, Lund, Sweden.

Correspondence: C. Persson, Dept of Clinical Pharmacology, Lund University Hospital, SE-221 85 Lund, Sweden
Fax: 46 462111987

Keywords: Asthma
chronic bronchitis
chronic obstructive pulmonary diseases
prevalence
rhinitis

Received: May 15 2000

Accepted after revision December 17 2000

This work was supported by the Swedish Medical Research Council, The Vårdal Foundation and Draco.

It is increasingly recognized that asthmatic individuals commonly exhibit nasal symptoms [1–4]. The prevalence of asthma among subjects suffering from allergic rhinitis has also been found to be several-fold greater than that observed in the general population [3]. Indeed, with few exceptions [5], previous studies on the epidemiology of upper airway disease have dealt almost exclusively with hay fever. With a focus on sinusitis, the concomitant occurrence of upper airway disease in asthma, bronchiectasis, chronic bronchitis, and diffuse panbronchiolitis has been reported [6–8]. However, in general, little information is currently available on the occurrence of rhinitis in association with the common bronchial diseases, chronic bronchitis and emphysema. The prevalence of asthma and chronic bronchitis/emphysema (CBE) in a random sample of an adult population in southern Sweden has been examined by a postal survey [9; see *Appendix 1*]. At the outset of that particular study, a separate aspect was included, involving detailed questions to survey the occurrence of different forms of rhinitis.

The present aim was to examine the prevalence of nasal symptoms, including provoking exposures, and to elucidate potential links between nasal conditions and self-reported asthma and CBE.

Methods

Study area

The study was performed in the southern part of Sweden, a part of the province of Skåne which has the highest population density in Sweden (84 inhabitants·km⁻²). The study area consisted of the municipality of Malmö (MK), the third largest city in Sweden, and the surrounding area, the county of Malmöhus (MLL). The population of MLL is 551,961, the majority of whom live in six towns. The population of MK is 234,796.

Climate

The climate is of the temperate type with an average yearly temperature of +8.4°C, with wet and foggy winters. The average temperature of the coldest month (February) is -0.5°C and the average temperature of the warmest month (July) is +16.8°C.

Study population

Four age groups (20–29, 30–39, 40–49 and 50–59 yrs) were selected for the study. Random sampling of 3,000

individuals from the municipality population records was performed in each age group, by selecting individuals born on the same two or three days during seven months throughout the year. This sampling strategy is standard procedure in Sweden [9]. In total, 12,079 individuals (1.5% of the population in MLL and MK) were included and there were comparable numbers of males and females in all age groups.

Questionnaire

The questions concerning nasal symptoms were specifically designed for this study (see *Appendix II*). Lower respiratory tract symptoms were recorded largely as described previously [9–11] using a questionnaire originating from the British Medical Research Council questionnaire [12]. The question identifying self-reported CBE was: "Have you now or have you had chronic bronchitis/emphysema?"; self-reported asthma was similarly determined [9]. Some slight modifications of the questions were made and a few new items added. In all, more than 50 questions were asked. The questionnaire was sent to the study population during the spring of 1992. If no response was received within two weeks, a first reminder was sent out including a new questionnaire, and finally, after another two weeks, a second, final reminder was mailed.

Statistical methods

Results are presented as a percentage of positive answers to a question. Nonresponders to single questions are quoted as "no/do not know". The computer-based analysis program SPSS (Statistical Package for the Social Sciences, 10.1 for PC, SPSS Inc., Chicago, IL, USA) was used in all calculations. The Chi-squared test was used to detect differences between groups; $p < 0.05$ was considered statistically significant. Multiple logistic regression analysis was used to assess the simultaneous influences of possible determinants of self-reported asthma and CBE. The independent variables included sex, smoking habits, self-reported allergic eye/nose catarrh, type of nasal symptoms and different factors releasing nasal symptoms. The results are expressed as odds ratios (ORs) and 95% confidence intervals (CI) are given.

Results

Participation

After two reminders, 8,469 subjects (70.1%) had returned a filled-in questionnaire. There were no significant differences in response rates due to sex or age.

Prevalence of nasal symptoms

In the whole study sample nasal symptoms were reported by 2,768 subjects (32.7% of the total study population) of whom 2,200 subjects (26.0%) had recurrent and 568 subjects (6.7%) permanent nasal symptoms (table 1). Blocked nose, was the most common and thick yellow nasal discharge the least common symptom. When a subject had seen a doctor due to symptoms from the nose, the most frequent diagnosis was allergy (11.5%), followed by sinusitis (6.2%) and common cold (6.1%). Self-reported asthma was slightly more prevalent than self-reported CBE (table 2). About 70% agreement was found between either self-reported bronchial disease and the information provided on the questionnaire that a doctor's diagnosis of asthma or CBE had been given.

Nasal symptoms due to different exposures

In the whole population, nasal symptoms provoked by at least one extrinsic factor were reported by 1,591 subjects (18.8%) (table 3). There was a female dominance throughout ($p < 0.001$). The three most common factors were grass pollen (9.7%), strong-smelling scents (8.1%) and tobacco fumes (8.0%). Symptoms due to exposure to pollen, animals, dust and mould were more common in the younger age groups than in the older age groups.

Seasonal variation of nasal symptoms

Nasal symptoms due to exposure to grass- or tree pollen as well as animals had a clear spring and summer seasonal tendency (table 4). Other factors (*e.g.* damp/cold air, dry air, tobacco-fumes, strong-smelling scents) evoked nasal symptoms with less seasonal tendency.

Table 1. – Prevalence (per cent) of nasal symptoms in the whole study sample (n=8,469)

Nasal symptoms	Age											
	20–59		20–59		20–29		30–39		40–49		50–59	
	All	M	F	M	F	M	F	M	F	M	F	
Seldom or never	67.3	68.2	66.5	66.1	63.3	64.9	63.7	68.0	67.7	73.7	71.3	
Recurrent	26.0	24.6	27.2	27.0	30.8	28.2	30.5	24.3	25.8	19.2	21.7	
Permanent	6.7	7.1	6.3	6.9	5.9	6.9	5.9	7.6	6.5	7.1	7.0	
Nasal watery discharge	16.7	15.3	17.9	16.9	19.0	16.2	19.4	15.2	18.4	12.9	15.1	
Thick yellow nasal discharge	5.7	5.2	6.1	6.4	7.2	5.5	8.1	5.1	4.0	3.9	5.2	
A blocked nose	20.6	19.5	21.5	20.2	23.4	23.5	25.1	18.3	20.7	16.1	17.1	
Sneezing	17.6	15.2	19.7	16.7	23.4	16.9	21.6	15.8	17.2	11.5	16.4	
Itching	7.2	5.5	8.8	7.1	10.2	6.2	9.8	4.9	8.9	3.9	6.2	

M: male; F: female.

Table 2. – Prevalence (per cent) of self-reported asthma, allergic rhinitis/conjunctivitis, chronic bronchitis/emphysema (CBE) and allergic eczema in subjects with no nasal symptoms, in all subjects and in subjects with recurrent or permanent nasal symptoms

	Self-reported asthma	Self-reported allergic eye/nose catarrh	Self-reported CBE	Self-reported allergic eczema
No/very seldom nasal symptoms	3.1	7.7	2.9	10.7
All subjects	5.5	20.5	4.6	14.6
Recurrent or permanent nasal symptoms	10.5	46.6	8.1	22.7

Combined nasal symptoms and bronchial disease

Of the subjects with CBE, 40.1% had recurrent or permanent nasal symptoms (table 5). The most common factors provoking nasal symptoms in subjects with CBE were damp/cold air, dust, and tobacco fumes. Subjects with CBE most frequently reported occurrence of thick yellow nasal discharge.

Of individuals with asthma, 45.8% had recurrent or permanent nasal symptoms. The most common factors provoking nasal symptoms in subjects with asthma were grass pollen, animals and tree pollen.

Nasal symptoms and smoking

Recurrent or permanent nasal symptoms (particularly thick yellow nasal discharge and nasal blockage) were reported slightly more by smokers (34.8%) than nonsmokers (31.6%; $p < 0.05$) (table 5). Conversely, allergic eye/nose catarrh was reported by 18.1% of smokers compared to 21.6% of nonsmokers ($p < 0.05$).

Nasal symptoms in relation to self-reported bronchial diseases

All self-reported diseases (asthma, allergic eye-/nose catarrh, CBE and allergic eczema) were more common in subjects with nasal symptoms compared to the whole study sample ($p < 0.05$) table 2.

Risk factor analysis using multiple logistic regression

Recurrent or permanent nasal symptoms were risk factors for both asthma (OR=3.61, 95% CI=2.98–4.38) and CBE (OR=2.93, 95% CI=2.39–3.60). In a multiple logistic regression model where watery nasal discharge, thick yellow discharge, a blocked nose, sneezing and itching were taken into account, sneezing and itching were risk factors for asthma but not for CBE. Conversely, thick yellow discharge was a risk factor for CBE but not for asthma. Watery nasal discharge and a blocked nose were risk factors for both asthma and CBE (table 6).

In a model where nasal symptoms due to different kinds of exposure were included as independent variables, nasal symptoms induced by grass pollen, animals, and mould were risk factors for self-reported asthma but not for CBE. Nasal symptoms due to dust, damp/cold air, dust and stress were risk factors for both asthma and CBE, the odds ratios being somewhat greater for CBE than asthma (table 7).

Discussion

Since bronchial disease conditions are self-reported, obvious limitations are applicable to interpretation and extrapolation of the present results. Yet, this study unravelled a high prevalence of recurrent or permanent allergic and nonallergic nasal symptoms in a random sample of adult inhabitants in southern Sweden. Subgroups and sex-dependence were recognized as

Table 3. – Prevalence (per cent) of nasal symptoms due to different kinds of exposure in the whole study sample (n=8,469)

Nasal symptoms due to	Age											
	20–59		20–59		20–29		30–39		40–49		50–59	
	All	M	F	M	F	M	F	M	F	M	F	
Tree pollen	6.9	5.8	7.8	9.5	9.9	7.0	10.2	4.3	6.7	2.5	4.6	
Grass pollen	9.7	8.9	10.5	12.9	13.2	11.0	12.4	7.4	9.3	4.3	7.1	
Animals	5.6	4.3	6.9	7.3	9.7	4.2	7.9	4.0	6.0	1.6	3.8	
Dust	7.5	6.3	8.7	6.9	8.2	6.8	10.5	7.5	9.5	3.9	6.9	
Mould	5.0	3.1	6.7	4.3	8.8	2.1	6.8	3.1	6.1	2.6	4.9	
Damp/cold air	6.3	4.9	7.5	5.0	8.0	4.7	7.0	4.3	7.3	5.6	7.7	
Dry/air	6.0	4.0	7.9	3.8	8.4	4.7	8.6	4.3	7.7	3.1	6.9	
Tobacco fumes	8.0	5.5	10.0	6.0	10.4	6.3	9.8	4.8	10.3	6.2	9.6	
Strong smelling scents	8.1	5.0	10.9	4.3	11.0	5.6	11.5	5.2	10.2	5.0	10.8	
Spicy food	2.8	1.8	3.7	2.0	4.7	1.2	3.0	1.7	3.4	2.1	3.4	
Red wine	2.4	1.6	3.1	1.0	1.4	1.6	3.5	1.8	4.1	2.0	3.4	
Stress	3.0	2.4	3.5	1.3	3.1	3.1	3.7	2.5	3.4	2.8	3.9	

M: male; F: female.

Table 4. – Seasonal variation of nasal symptoms

Nasal symptoms due to:	Spring	Summer	Autumn	Winter
Tree pollen	79.6	66.7	29.2	24.1
Grass pollen	69.9	69.6	31.3	24.4
Animals	59.0	51.7	31.7	28.6
Dust	64.3	54.4	48.4	47.2
Mould	64.8	54.0	49.0	46.9
Damp/cold air	61.8	43.2	56.6	58.5
Dry air	57.6	46.9	52.0	50.0
Tobacco fumes	62.0	48.9	47.3	46.7
Strong smelling scents	65.9	53.9	48.0	45.8
Spicy food	66.7	50.4	56.0	55.6
Red wine	65.0	50.5	51.0	52.0
Stress or discomfort	59.1	45.7	54.3	52.4

Data presented as per cent of those who reported symptoms due to each particular kind of exposure.

provoking the nasal symptoms with respect to different factors. Frequent occurrence of nasal symptoms, together with either asthma or CBE, was demonstrated. Furthermore, this study unravelled differing associations between allergic and irritant triggers of nasal symptoms with regard to asthma or CBE

The present questionnaire contained questions commonly used to demonstrate the prevalence of rhinitis. Also, the subjective ratings of symptoms such as blockage, sneezing, and secretion are used for the quantitative assessment of clinical effects of any intervention [13]. The present study also explored a range of symptom-provoking exposures. Despite a comprehensive questionnaire an acceptable response rate (above 70%) was attained. This compares favourably with a

postal survey study on epidemiology of rhinitis carried out by SIBBALD and RINK [5], in which 39% of 7,702 adults returned "usable questionnaires". SIBBALD and RINK [5] interviewed 466 of their subjects, demonstrating that over 90% of the questionnaire-based diagnoses, rhinitis or no rhinitis, were accurate. Self-reported asthma, as assessed in this study, may agree well with the actual occurrence of asthma [14]. Indeed, 70% of the present "asthmatics" stated that this diagnosis had also been given by a doctor.

The definition of CBE is simply a positive answer to the question: "have you now or have you had chronic bronchitis or emphysema?". However, almost 70% of those with self-reported CBE stated that they had been given the diagnosis by a doctor. Further, the present findings on the prevalence of probable CBE agree with previous observations [10, 11]. Importantly, there was little overlap between self-reported asthma and CBE in the present subjects [9].

Almost independent of age group and type of culprit exposure, women, more frequently than men, blamed specific factors as causes of their nasal problem. Such a sex dependency agrees with previous reports in this [97] and other fields [15]. The female dominance may, in part, reflect a heightened self-awareness of the kind of environmental provocation that caused nasal symptoms (tables 1 and 2). However, as exemplified by the demonstration of increased cough reflex sensitivity of female airways [16], physiological differences between the sexes as regards respiratory tract responsiveness to inhaled factors may also exist.

Twelve different provoking factors/exposures were included in the present questionnaire. Expectedly, nasal symptoms due to grass- and tree pollen exhibited

Table 5. – Nasal symptoms (per cent) due to different kinds of exposure in all subjects and in the different subgroups

	All subjects	Self-reported asthma	Self-reported allergic rhinitis/conjunctivitis	Self-reported CBE	Self-reported allergic eczema	Nonsmokers	Smokers
Subjects n	8469	469	1732	392	1240	1772	996
Recurrent or permanent nasal symptoms	32.7	45.8	57.3	40.1	34.7	31.6	34.8*
Nasal watery discharge	16.7	36.9	45.9	29.8	27.8	16.7	16.6
Thick yellow nasal discharge	5.7	10.9	9.2	16.1	13.5	5.0	7.2*
A blocked nose	20.6	42.9	46.4	36.2	31.3	19.8	22.7*
Sneezing	17.6	40.7	52.0	29.3	27.3	17.3	18.2
Itching	7.2	20.9	25.0	12.5	10.1	7.2	7.3
Pulmonary symptoms associated with nasal symptoms	15.4	51.4	37.1	48.2	28.4	13.1	19.3*
Nasal symptoms due to any extrinsic factors	18.8	45.8	57.3	30.1	34.7	18.8	18.8
Tree pollen	6.9	26.7	30.4	10.5	16.3	7.0	6.7
Grass pollen	9.7	36.7	42.3	16.6	20.9	10.0	9.2
Animals	5.6	29.9	22.7	9.9	14.7	5.5	5.9
Dust	7.5	26.4	24.2	20.7	17.1	7.5	7.7
Mould	5.0	23.5	16.0	15.3	12.2	4.7	5.5
Damp/cold air	6.3	23.0	15.8	23.2	12.2	6.0	6.9
Dry air	6.0	13.6	15.2	14.3	12.6	5.8	6.5
Tobacco fumes	8.0	20.9	22.3	19.6	15.2	9.9	4.4*
Strong smelling scents	8.1	23.7	25.9	18.1	16.5	8.1	8.0
Spicy food	2.8	7.9	7.6	6.4	6.6	2.7	2.8
Red wine	2.4	6.6	6.5	6.4	4.4	2.5	2.1
Stress	3.0	10.9	7.2	12.1	6.7	2.7	3.6*

*: $p < 0.05$. p-Values represent difference between smokers and nonsmokers, and are nonsignificant unless marked differently.

Table 6. – Odds ratio (OR) and 95% confidence intervals (CI) of asthma and chronic bronchitis/emphysema (CBE) due to different nasal symptoms in 20 to 59-yr-old subjects calculated using multiple logistic regression analysis

Risk factor	Asthma		CBE	
	OR	95% CI	OR	95% CI
Watery nasal catarrh	1.61	1.26–2.06	1.50	1.14–1.97
Thick yellow nasal catarrh	1.11	0.80–1.53	2.38	1.74–3.25
Blocked nose	1.85	1.4–2.32	1.53	1.18–1.99
Sneezing	1.66	1.27–2.17	1.09	0.80–1.47
Itching	1.71	1.30–2.26	1.19	0.84–1.69

seasonal spring and summer dependency. Symptoms due to animal exposure were also concentrated to spring and summer, perhaps reflecting an increased sensitivity to multiple allergens during these "laden" seasons. Since the questionnaire was distributed during late spring/early summer, a recall bias may also have contributed to this finding. Implying allergy as a causal factor, almost 20% of the present population reported that their nasal symptoms were frequently combined with eye symptoms such as itching, redness, and tear secretion. Self-diagnosed allergic rhinitis and/or conjunctivitis also represented a prevalence of 20% in this study. Large global variations in the prevalence of allergic rhinitis have been demonstrated ranging from <5% to >30% [3, 17]. In Sweden allergic rhinitis is increasingly common [17, 18]. The prevalence of allergic rhinitis as reported during the 1990s was 15% in both Sweden and Denmark [18, 19]; the latter country is geographically close to the present study population. This study supports an increasing prevalence of allergic rhinitis in this area.

A significant rhinitis group has nasal symptoms unrelated to allergy [20] but the prevalence of non-allergic rhinitis has not been studied extensively [3]. SIBBALD and RINK [5] recorded atopy in 78% of those with seasonal rhinitis and in 68% of those with perennial rhinitis. In the laboratory, cold air provocation has a high specificity as regards the assessment of nasal disease in the form of nonallergic rhinitis [21]. Nonallergic rhinitis was probably a dominating form in

Table 7. – Odds ratio and 95% confidence interval of asthma and chronic bronchitis/emphysema (CBE) due to different nasal exposures in 20 to 59-yr-old subjects, calculated using multiple logistic regression analysis

Risk factor	Asthma		CBE	
	OR	95% CI	OR	95% CI
Tree pollen	1.17	0.82–1.66	0.70	0.44–1.13
Grass pollen	2.38	1.72–3.29	1.09	0.72–1.65
Animals	3.77	2.85–5.00	0.90	0.60–1.36
Dust	1.41	1.04–1.92	1.69	1.19–2.39
Mould	2.07	1.50–2.87	1.41	0.96–2.07
Damp/cold air	1.98	1.46–2.69	3.13	2.29–4.29
Dry air	0.86	0.60–1.22	1.05	0.73–1.51
Tobacco fumes	0.91	0.66–1.26	1.22	0.86–1.74
Strong smelling scents	0.99	0.7–1.3	1.06	0.74–1.52
Spicy food	0.96	0.61–1.51	0.83	0.51–1.36
Redwine	0.98	0.61–1.59	1.31	0.79–2.15
Stress or discomfort	1.98	1.33–2.93	2.48	1.68–3.65

the 12.4% of the present study population, who had nasal symptoms without concomitant eye symptoms, and who reported that damp/cold air, tobacco fumes, and strong smelling scents, rather than commonly acknowledged allergic factors, provoked their symptoms. Data generated in the late 1950s suggest that the occurrence of hay fever may be lower in smokers than in nonsmokers [3]. On the other hand, NORRMAN *et al.* [22], examining teenagers in northern Sweden, observed that mothers stopping smoking favoured remission of self-reported hay fever. The present study did not observe any difference between smokers and nonsmokers regarding associations between nasal symptoms and the "allergic" exposure factors (table 5). Expectedly, relatively more nonsmokers than smokers considered tobacco fumes causative to nasal symptoms (table 5). Symptoms such as thick yellow nasal discharge and blocked nose contributed to the present finding that smokers experienced more recurrent or permanent nasal symptoms than did nonsmokers (table 5). Smoking-associated increased prevalence of chronic rhinitis was also found in a survey of the US population 1976–1980 [23]. A combination of the nasal and pulmonary symptoms was more common among smokers (19.3%) than nonsmokers (13.1%) in that study, suggesting that exposure to high levels of tobacco smoke is a factor to be considered in development of pan-airway diseases, particularly with regard to coexistence of rhinitis and CBE (see later).

Several nasal symptoms and provoking factors were identified as selective risk factors for probable asthma and CBE, respectively, supporting the distinction between the different self-reported bronchial diseases in this study. Also, a relatively severe nasal aspect, such as thick yellow discharge, was a risk factor exclusively for CBE. Conversely, an increased risk for asthma, but not CBE, concerned subjects with nasal symptoms evoked by allergens. These data agree with the high prevalence of asthma among subjects with allergic rhinitis [3, 24, 25]. Importantly, the association between asthma and rhinitis may also be reflected by beneficial effects on both conditions by treatment of only one of the two diseases [2, 26, 27]. Likely due to nonallergic mechanisms, nasal symptoms evoked by damp/cold air and stress [28] were significant risk factors for both asthma and CBE in the present study. In view of the particular nasal symptoms and provoking factors, that were associated with increased risk for concomitant rhinitis and CBE, there may have been a substantial component of nonallergic rhinitis in these subjects. This, again, is different from the link to asthma where allergic factors appear to dominate. The airway inflammation in CBE is also different from that in asthma [29, 30], and may better correspond to different forms of non-allergic rhinitis [2, 20]. The present data indicate that attention should be given to the nasal condition and its treatment, in both CBE and asthma.

Nasal symptoms evoked by damp/cold air involved increased risk for asthma and, especially, for CBE. This observation is in keeping with the general role of this kind of exposure in exacerbation of symptoms in bronchial disease. Being among the less frequently reported nasal symptom inducers, stress, nevertheless, turned out to be a significant risk factor for both

asthma and CBE. Despite the intriguing observations by HOLMES *et al.* [28] in the 1940s stress remains a poorly investigated factor in the pathogenesis of airway diseases.

In conclusion, the present data suggest that recurrent or permanent nasal symptoms are present in one-third of the adult population in southern Sweden, and that associations between upper and lower airway symptoms are common in both asthma and chronic bronchitis/emphysema. Special nasal symptoms, as well as nasal symptoms provoked by special environmental factors, could be distinguished as relatively selective risk factors for either asthma or chronic bronchitis/emphysema.

Appendix I

Questionnaire (questions about the lung).

Answer by crossing on the relevant line if no other instructions are given.

1. Have any of your parents, brothers or sisters, or children had:

- a) Asthma
- b) Allergic eye-/nose catarrh (hay fever)
- c) Chronic bronchitis or emphysema
- d) Allergic eczema

2. Have you now, or have you had, any of the following diseases:

- a) Asthma
- b) Allergic eye/nose catarrh (hay fever)
- c) Chronic bronchitis or emphysema
- d) Any other lung or airways disease
- e) If yes, which? _____
- f) Allergic eczema

3. Have you been diagnosed by a doctor as having asthma?

4. Have you been diagnosed by a doctor as having chronic bronchitis (bronchitis) or emphysema?

5. Do you currently use asthma medicines (permanently or as needed)? If yes:

- a) As needed
- b) Permanently
- c) I use inhaled steroids every day (Pulmicort or Becotide)

6. Have you had asthma symptoms during the last 12 months *i.e.* intermittent or attacks of breathlessness? The symptoms may exist simultaneously with or without cough or wheezing?

7. Have you had long-standing cough during the last years?

8. Do you usually have phlegm when coughing, or do you have phlegm on your chest which is difficult to bring up? If yes:

- a) Do you bring up phlegm when coughing on most days during periods of at least three months?
- b) Have you had such periods during at least two successive years?

9. Have you wheezing, whistling or a noisy sound in your chest when breathing?

10. Do you usually have breathlessness, wheeze or severe cough:

- a) During exertion
- b) In cold weather
- c) In misty/foggy weather
- d) In dusty places
- e) From cigarette or tobacco smoke
- f) From car exhaust fumes/in towns
- g) From strong smelling scents *e.g.* perfumes, spices, cleaner, printing ink *etc.*
- h) From pollen *e.g.* birch, grass
- i) From furred animals
- j) From stress

11. Have you, during the last 12 months, awakened due to cough, breathlessness or "tightness" in your chest?

12. How would you characterize your breathing?

- a) I very seldom have problems with my breathing.
- b) Occasionally I have problems when breathing.
- c) My breathing is never quite well.

13. Do you smoke? (smokers also include those who smoke a few cigarettes or pipe fills a week, and those who have stopped smoking during the last year)

If yes:

How many cigarettes do you smoke per day?

- a) Less than 5
- b) 5–14
- c) 15 or more If no:
- d) Have you been a smoker but stopped smoking more than a year ago?
- e) Does anyone else in your family smoke?

14. Do you live close to a road with heavy traffic?

15. What is your current work/occupation?

16. How many years have you been working in this occupation?

17. If you have had another job/occupation for at least 5 years, please state what:

18. How many years have you been living in the Malmöhus county?

Appendix II

Questionnaire (questions about the nose).

Answer with a cross at the relevant line if no other instructions are given.

1. How often do you have nasal symptoms? Please tick one alternative.
- a) I never or very seldom have disturbing nasal symptoms
 - b) I have recurrent disturbing nasal symptoms
 - c) I have permanent disturbing nasal symptoms

If you have answered b or c to the above question please continue to answer the questionnaire

2. When you have nasal symptoms, which symptom or symptoms do you have. Please tick one or more alternatives.
- a) Watery nasal discharge
 - b) Thick yellow nasal discharge
 - c) A blocked nose
 - d) Sneezing
 - e) Itching
 - f) Any other symptom (please notify which _____)

3. When during the year do you have nasal symptoms and how often during those periods? (Please tick one alternative during each season.)

Spring

- A
- 1. Daily during at least one week
 - 2. One or several times a week
 - 3. Occasional times a month
 - 4. I have no symptoms during this period

Summer

- B
- 1. Daily during at least one week
 - 2. One or several times a week
 - 3. Occasional times a month
 - 4. I have no symptoms during this period

Autumn

- C
- 1. Daily during at least one week
 - 2. One or several times a week
 - 3. Occasional times a month
 - 4. I have no symptoms during this period

Winter

- D
- 1. Daily during at least one week
 - 2. One or several times a week
 - 3. Occasional times a month
 - 4. I have no symptoms during this period

4. Are the nasal symptoms provoked or worsened by environmental factors? If yes tick the appropriate box or boxes below.

- | | Yes | No |
|---------------------------------------|--------------------------|--------------------------|
| a) Tree-pollen (<i>e.g.</i> birch) | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Grass-pollen (<i>e.g.</i> grass) | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Animals (please state which _____) | <input type="checkbox"/> | <input type="checkbox"/> |
| d) House dust | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Mould | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Damp and/or cold air | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Dry air | <input type="checkbox"/> | <input type="checkbox"/> |
| h) Tobacco fumes | <input type="checkbox"/> | <input type="checkbox"/> |

- i) Strong-smelling scents (*e.g.* perfumes)
- j) Spicy food
- k) Red wine
- l) Other food (please state which _____)
- m) Stress or discomfort
- n) Something else (please state what _____)

5. How often are the nasal symptoms associated with symptoms from the eyes (itching, redness and or increased tear production)? Please tick one alternative.

- a) Often
- b) Sometimes
- c) Never

6. How often are the nasal symptoms associated with symptoms from the lungs (cough, breathlessness and/or wheezing)? Please tick one alternative.

- a) Often
- b) Sometimes
- c) Never

7. Have you seen a doctor due to your nasal symptoms? If yes what diagnosis did you get? (Please tick one or more alternatives).

- a) Allergy
- b) A common cold
- c) Sinusitis
- d) Nasal polyps
- e) Narrow nasal lumen
- f) Another explanation
- g) No explanation

8. What is your own opinion about your nasal symptoms? (Please tick one or more alternatives).

- a) Allergy
- b) A common cold
- c) Sinusitis
- d) Another explanation (please state which)
- e) No explanation

Acknowledgements. Many thanks to J. Lanke, K. Heyman, S-Å. Johansson, L-H. Lindholm and B. Lundbäck for helpful assistance.

References

1. Pedersen PA, Weeke ER. Asthma and allergic rhinitis in the same patients. *Allergy* 1983; 38: 25-29.
2. Persson CGA, Svensson C, Greiff L, *et al.* The use of the nose to study the inflammatory response of the respiratory tract. *Thorax* 1992; 47: 993-1000.
3. Sibbald B, Strachan P *In:* Busse WW, Holgate ST, eds. Asthma and Rhinitis. London, Blackwell, 1995; 32-43.
4. Kapsali T E, Horowitz F, Diemer , Togias A. Rhinitis is ubiquitous in asthmatics (abstract). *J Allergy Clin Immunol* 1997; 99: S138.
5. Sibbald B, Rink E. Epidemiology of seasonal and perennial rhinitis; clinical presentation and medical history. *Thorax* 1991; 46: 895-901.

6. Wasson WW. Bronchosinusitis. *JAMA* 1929; 93: 2018–2021.
7. Fitzgerald JE, King TE, Lynch DA, Tuder RM, Schwarz MI. Diffuse panbronchiolitis in the United States. *Am J Respir Crit Care Med* 1996; 154: 497–503.
8. Chew W, Burnsed D. The sinobronchial syndrome. *Ear Nose Throat J* 1979; 58: 446–450.
9. Montn mery P,  delroth E, Heuman K, *et al.* Prevalence of obstructive lung diseases and respiratory symptoms in southern Sweden. *Respir Med* 1998; 92: 1337–1345.
10. Lundb ck B, Nystr m L, Rosenhall L, Stjernberg N. Obstructive lung disease in northern Sweden: respiratory symptoms assessed in a postal survey. *Eur Respir J* 1991; 4: 257–266.
11. Stjernberg N, Eklund A, Nystr m L, Rosenhall L, Emmelin A, Str mqvist LH. Prevalence of bronchial asthma and chronic bronchitis in a community in northern Sweden; relation to environmental and occupational exposure to sulphur dioxide. *Eur J Respir Dis* 1985; 67: 41–49.
12. Standardized questionnaires on respiratory symptoms. *BMJ* 1960; 2: 1665.
13. Klementsson H, Svensson C, Andersson M, Venge P, Pipkorn U, Persson CGA. Eosinophils, secretory responsiveness and glucocorticoid-induced effects on the allergic nasal mucosa during a weak pollen season. *Clin Exp Allergy* 1991; 21: 705–710.
14. Lundb ck B. Asthma, Chronic bronchitis and Respiratory Symptoms: Prevalence and Important Determinants. The Obstructive Lung Disease In Northern Sweden Study I. Thesis, Ume  University Sweden, 1993; 3–118.
15. Martin R, Biswas P, Freemantle S, Pearce G, Mann R. Age and sex distribution of suspected adverse drug reactions to newly marketed drugs in general practice in England: analysis of 48 cohort studies. *Br J Clin Pharmacol* 1998; 48: 505–511.
16. Dicipinigaitis PV, Rauf K. The influence of gender on cough reflex sensitivity. *Chest* 1998; 113: 1319–1321.
17.  berg N, Lundb ck B, M ller C, *et al.* Threefold increase of asthma and allergic rhinitis in Swedish military recruits between 1971 and 1992. *Allergy* 1996; 51(Suppl. 3): 112.
18.  berg N. Asthma and allergic rhinitis in Swedish conscripts. *Clin Exp Allergy* 1989; 19: 59–63.
19. Keiding L. Asthma, allergy, and other types of hypersensitivity in Denmark-and the development 1987–1994. (in Danish, summary in English). *DIKE* 1997
20. Allergic and non-allergic rhinitis. In: Busse W, Holgate ST, eds. *Asthma and Rhinitis*. Boston, Blackwell, 1995; pp. 145–155.
21. Braat JP, Mulder PG, Fokkens WJ, van Wijk RG, Rijntjes E. Intranasal cold dry air is superior to histamine challenge in determining the presence and degree of nasal hyperreactivity in nonallergic non-infectious perennial rhinitis. *Am J Respir Crit Care Med* 1998; 157: 1748–1755.
22. Norrman E, Nystr m L, J nsson E, Stjernberg N. Prevalence and incidence of asthma and rhinoconjunctivitis in Swedish teenagers. *Allergy* 1998; 53: 28–35.
23. Turkeltaub PC, Gergen PJ. Prevalence of upper and lower respiratory conditions in the US population by social and environmental factors: data from the second National Health and Nutrition Examination Survey, 1976 to 1980 (NHANES II). *Ann Allergy* 1991; 67: 147–154.
24. Edfors-Lubs M. Allergy in 7000 twin pairs. *Acta Allergol* 1971; 26: 249–285.
25. Boulet LP, Turcotte H, Laprise C, *et al.* Comparative degree and type of sensitization to common indoor and outdoor allergens in subjects with allergic rhinitis and/or asthma. *Clin Exp Allergy* 1997; 27: 52–59.
26. Henriksen JM, Wenzel A. Effect of an intranasally administered corticosteroid (budesonide) on nasal obstruction, mouth breathing, and asthma. *Am Rev Respir Dis* 1984; 130: 1014–1018.
27. Greiff L, Andersson M, Svensson C, *et al.* Effects of orally inhaled budesonide in seasonal allergic rhinitis. *Eur Respir J* 1998; 11: 1268–1273.
28. The nose. An experimental study of reactions within the nose in human subjects during varying life experiences. Springfield Charles C Thomas, 1950; 1–154.
29. Jeffery PK. Pathology of asthma and COPD: a synopsis. *Eur Respir Rev* 1997; 7: 111–118.
30. Airway pathology of functional significance in chronic bronchitis and chronic obstructive airway disease. In: Persson C, Brattsand R, Laitinen L, Venge P, eds. *Inflammatory Indices in Chronic Bronchitis*. Boston, Birkh user, 1990; pp. 11–20.