

A population survey of respiratory symptoms in the elderly

L. Dow*, D. Coggon**, C. Osmond**, S.T. Holgate*

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ABSTRACT: Reversible airways obstruction is not uncommon in the elderly, but may be overlooked because of the high prevalence of other disorders with a similar presentation. In a search for patterns of symptoms which might predict treatable airways obstruction, we carried out a survey of men and women aged 65 yrs and over. Postal questionnaires were completed by 2,161 subjects selected at random from the lists of three general practices. Almost 60% of the sample complained of one or more respiratory symptoms. Smoking was a more important risk factor than age, sex or social class, and was associated particularly with wheeze, morning phlegm and chest tightness on waking. Several groups of symptoms tended to cluster in the same individuals. The two most closely related were chest tightness and breathlessness in response to animals, dust and feathers. Responses to irritants tended to cluster according to the symptom produced (cough, breathlessness or wheeze) rather than the provoking stimulus (smoke, cold air, household chemicals or traffic fumes). There was no evidence for the existence of the "bronchial irritability syndrome" which has been linked with asthma in younger adults. The relationship of symptoms to respiratory function and bronchial reactivity will be reported in a further publication.

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* Dept of Medicine 1 and ** MRC Environmental Epidemiology Unit, Southampton General Hospital, University of Southampton, Southampton, UK.

Correspondence: Dr L. Dow, Medicine 1, Level D, Centre Block, Southampton General Hospital, Tremona Road, Southampton, SO9 4XY, UK.

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Respiratory symptoms are common in the elderly, and are quite often associated with reversible airways obstruction. In a study of elderly patients attending day hospitals or living in old peoples' homes in North Wales, 82 of 199 subjects responded to inhaled salbutamol with an improvement in peak expiratory flow of 15% or more [1]. Similarly, in a community survey in South Wales, among 81 subjects aged 70 yrs or over with a history of wheeze, 12 showed both an increase in forced expiratory volume in one second (FEV₁) of at least 15% after inhalation of salbutamol, and also a consistent response to treatment with corticosteroids or bronchodilators [2]. Three of these subjects were previously undiagnosed.

One reason why treatable airways obstruction is often unrecognized in the elderly patient is the high prevalence of other forms of respiratory disease and cardiac failure at older ages [3]. Attempts to define clinical features which would help predict a therapeutic response to bronchodilators and corticosteroids have been largely unrewarding. A personal or family history of allergic disease may be of some discriminatory value, but the presence of cough, phlegm, wheeze or breathlessness has been shown to have little predictive power [2, 4].

In adults aged less than 70 years, MORTAGY *et al.* [5] have reported a cluster of symptoms which they

considered was highly predictive of increased bronchial reactivity to inhaled histamine. Furthermore, they found that this "bronchial irritability syndrome" (defined as histamine hyperreactivity in conjunction with one or more of nocturnal breathlessness, chest tightness on waking lasting at least one hour, and breathlessness or wheeze in response to cold air, smoke, household chemicals or traffic fumes) was strongly associated with a history of clinically diagnosed asthma. It is possible that a similar syndrome exists in the elderly [6] and might be useful in the identification of treatable airways obstruction. To test this hypothesis, we have undertaken a survey of respiratory symptoms and pulmonary function in men and women aged 65 yrs and over. In this paper we report the prevalence and interrelationship of symptoms and their determinants. The relation of symptoms to respiratory function and bronchial reactivity will be described in a further publication [7].

Methods

Subjects were selected from the lists of three general practices in the Southampton district. A stratified random sampling method was used to obtain approximately equal numbers of men and women in the age ranges

Table 1. — Distribution of missing information and overall prevalence of symptoms

| Symptom | No. of subjects who did not answer question | No. of subjects who answered question | No. of subjects who reported symptom | Prevalence % in those who answered |
|--|---|---------------------------------------|--------------------------------------|------------------------------------|
| 1. Wheeze at any time in past 12 months | 28 | 2133 | 605 | 28.4 |
| 2. Breathlessness at rest during the day at any time in past 12 months | 29 | 2132 | 439 | 20.6 |
| 3. Woken at night by breathlessness at any time in past 12 months | 43 | 2118 | 202 | 9.5 |
| 4. Usually bring up phlegm from chest first thing in the morning | 93 | 2068 | 447 | 21.6 |
| 5. Breathlessness on exposure to animals, dust or feathers | 115 | 2046 | 112 | 5.5 |
| 6. Chest tightness on exposure to animals, dust or feathers | 103 | 2058 | 74 | 3.6 |
| 7. Chest tightness on waking at any time in past 12 months | 47 | 2114 | 348 | 16.5 |
| 8. Chest tightness for an hour or more on waking at any time in past 12 months | 134 | 2027 | 103 | 5.1 |
| 9. Breathlessness on exposure to cold air | 0 | 2161 | 291 | 13.5 |
| Wheeze on exposure to cold air | 0 | 2161 | 83 | 3.8 |
| 10. Cough on exposure to cold air | 0 | 2161 | 283 | 13.1 |
| 11. Breathlessness on exposure to household chemicals | 0 | 2161 | 115 | 5.3 |
| 12. Wheeze on exposure to household chemicals | 0 | 2161 | 55 | 2.5 |
| 13. Cough on exposure to household chemicals | 0 | 2161 | 231 | 10.7 |
| 14. Breathlessness on exposure to traffic fumes | 0 | 2161 | 138 | 6.4 |
| 15. Wheeze on exposure to traffic fumes | 0 | 2161 | 52 | 2.4 |
| 16. Cough on exposure to traffic fumes | 0 | 2161 | 264 | 12.2 |
| 17. Breathlessness on exposure to smoke | 1 | 2160 | 175 | 8.1 |
| 18. Wheeze on exposure to smoke | 1 | 2160 | 72 | 3.3 |
| 19. Cough on exposure to smoke | 2 | 2159 | 466 | 21.6 |

65–74 yrs and 75 yrs and over. Each subject was sent a postal questionnaire with a letter of explanation signed by his or her general practitioner. The questionnaire asked about symptoms of bronchitis, airways obstruction and bronchial irritability and about smoking habits and last full-time occupation. Married women were also asked to give the last full-time occupation of their husbands. The section of the enquiry relating to bronchitis and airways obstruction (symptoms 1, 2 and 4–6 in table 1) was taken from a questionnaire developed by the Department of Community Medicine at St Thomas's Hospital, while the questions about bronchial irritability (symptoms 3 and 7–20 in table 1) were identical to those used by MORTAGY *et al.* [5] in their study of adults below the age of 70 yrs. Non-responders were sent a reminder after five weeks.

The relationship between each pair of symptoms, A and B, was summarized by the odds ratio $n_{AB}n_{\bar{A}\bar{B}}/n_{A\bar{B}}n_{\bar{A}B}$ where n_{AB} was the number of subjects who reported both, A and B, $n_{\bar{A}\bar{B}}$ the number who reported neither A or B, $n_{A\bar{B}}$ the number who reported A but not B, and $n_{\bar{A}B}$ the number who reported B but not A. An advantage of this statistic is that it is not dependent on symptom prevalence. The overall relationship between symptoms was examined by multidimensional scaling based on the odds ratio [8]. This technique is similar to a principal components analysis, but summarizes all the information in a two dimensional plot. Symptoms which tend to occur together are represented by clusters.

Risk factors for symptoms were examined by multiple logistic regression.

Results

The original sample comprised 2,573 subjects of whom 2,161 (84.0%) completed questionnaires. Included in the 412 non-responders, were 121 who had recently died or moved and 16 who were too ill to answer. The ages of the responders ranged from 65 to 96 yrs. One thousand and seventy seven of the subjects were men and 1,084 were women.

Some of the responders did not answer all of the questions satisfactorily and information about individual symptoms was missing for up to 6.2% of subjects. Table 1 shows the distribution of missing information and the prevalence of each symptom among those who answered the relevant question. The most frequently reported symptoms were wheeze at some time in the past 12 months (28.4%), morning phlegm (21.6%), cough on exposure to smoke (21.6%) and daytime breathlessness at rest (20.6%). Altogether 1,262 subjects (58.4%) reported at least one symptom.

When examined in pairs, the two most closely related symptoms were chest tightness and breathlessness in response to animals, dust or feathers (odds ratio = 315.0). (The odds ratio for the association between chest tightness on waking of any duration and chest

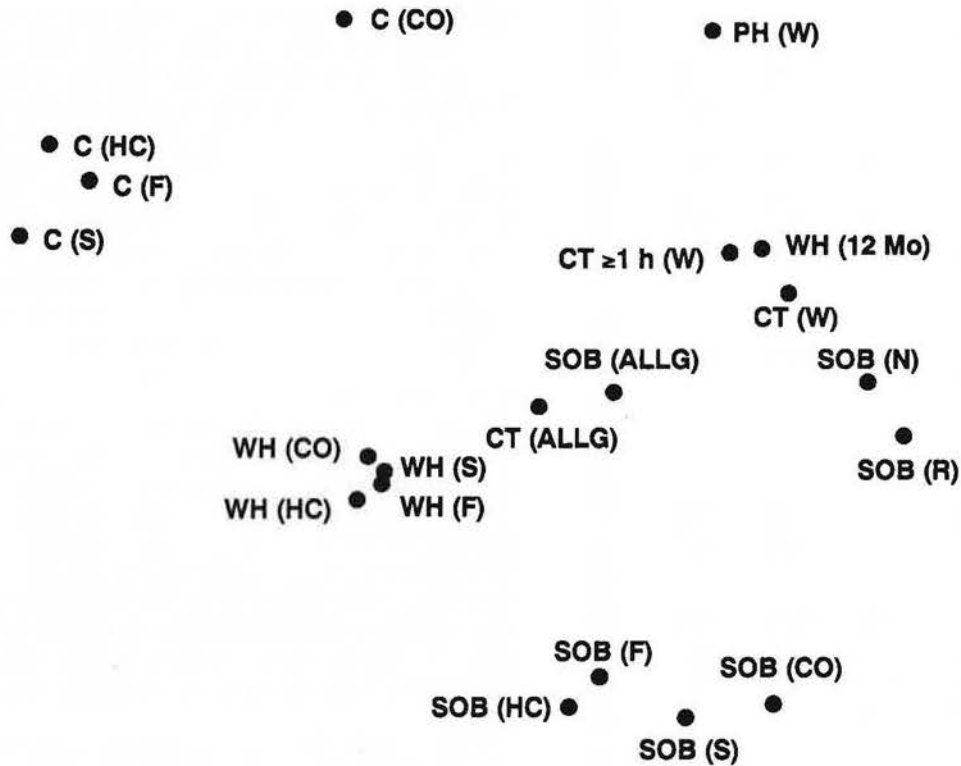


Fig. 1. – Multidimensional scaling of symptoms. Symptoms which are close on this figure may occur together most often. Symptoms. C: cough; CT: chest tightness; CT \geq 1 h: chest tightness \geq 1 h; PH: phlegm; SOB(R): shortness of breath at rest; SOB(N): shortness of breath at night; WH: wheeze; Circumstance. ALLG: exposure to allergens; CO: going into cold air; F: exposure to traffic fumes; HC: exposure to household chemicals; S: on entering a smoky room; R: at rest during day; N: at night; W: on waking; 12 Mo: at any time in past 12 months.

Table 2. – Odds ratios for pairs of symptoms

| | | | | | | | | | |
|---|--------|------------------------|--------------------------|----------------|---|---------------------------|---|--|--|
| Breathlessness at rest | 9.4 | | | | | | | | |
| Nocturnal breathlessness | 11.2 | 37.2 | | | | | | | |
| Morning phlegm | 8.5 | 4.5 | 3.7 | | | | | | |
| Breathlessness and/or chest tightness on exposure to common allergens | 9.7 | 10.3 | 7.0 | 5.0 | | | | | |
| Chest tightness on waking | 31.5 | 14.7 | 17.3 | 8.4 | 8.5 | | | | |
| Chest tightness for an hour or more on waking | 18.1 | 13.1 | 10.9 | 9.1 | 10.3 | 8 | | | |
| Breathlessness on exposure to one or more irritants* | 5.1 | 10.9 | 7.3 | 2.6 | 7.3 | 6.2 | 6.5 | | |
| Wheeze on exposure to one or more irritants* | 9.7 | 3.6 | 3.8 | 4.2 | 6.0 | 6.0 | 5.4 | 3.8 | |
| Cough on exposure to one or more irritants* | 2.9 | 1.8 | 2.1 | 3.1 | 3.1 | 2.6 | 2.7 | 1.2 | 3.8 |
| | Wheeze | Breathlessness at rest | Nocturnal breathlessness | Morning phlegm | Breathlessness and/or chest tightness on exposure to common allergens | Chest tightness on waking | Chest tightness for an hour or more on waking | Breathlessness on exposure to one or more irritants* | Wheeze on exposure to one or more irritants* |

*: cold air, household chemicals, traffic fumes or smoke.

Table 3. - Association of symptoms with sex, age, smoking habits and social class: odds ratios (with 95% confidence intervals)

| Risk factor (with number in sample who completed questionnaires') | Wheeze | Breathlessness at rest | Nocturnal breathlessness | Morning phlegm | Breathlessness and or chest tightness on exposure to common allergens | Chest tightness on waking | Chest tightness for an hour or more on waking | Breathlessness on exposure to one or more irritants* | Wheeze on exposure to one or more irritants* | Cough on exposure to one or more irritants* |
|---|---------------|---------------------------|-----------------------------|-------------------|--|------------------------------|---|---|---|--|
| Sex | | | | | | | | | | |
| male (1077) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| female (1084) | 0.9 (0.7-1.1) | 1.0 (0.7-1.2) | 1.1 (0.8-1.5) | 0.5 (0.4-0.7) | 0.9 (0.6-1.3) | 0.8 (0.6-1.1) | 0.7 (0.5-1.2) | 1.0 (0.8-1.3) | 0.9 (0.6-1.3) | 1.1 (0.9-1.4) |
| Age | | | | | | | | | | |
| 65-74 yrs (1159) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 75+ yrs (1002) | 1.2 (1.0-1.5) | 1.3 (1.0-1.6) | 1.2 (0.9-1.6) | 1.3 (1.0-1.6) | 0.8 (0.6-1.2) | 1.6 (1.2-2.0) | 1.4 (0.9-2.2) | 1.0 (0.8-1.3) | 1.1 (0.8-1.6) | 0.7 (0.5-0.8) |
| Smoking habits | | | | | | | | | | |
| nonsmoker (839) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| ex-smoker (904) | 2.1 (1.6-2.7) | 1.3 (1.0-1.8) | 0.9 (0.6-1.4) | 1.6 (1.2-2.2) | 1.4 (0.9-2.2) | 1.7 (1.3-2.4) | 1.6 (0.9-2.7) | 1.2 (0.9-1.6) | 1.4 (0.9-2.1) | 1.4 (1.1-1.7) |
| current smoker (370) | 2.5 (1.8-3.5) | 1.3 (0.9-1.9) | 0.8 (0.5-1.4) | 3.7 (2.6-5.2) | 1.1 (0.6-2.0) | 1.8 (1.2-2.6) | 1.6 (0.8-3.0) | 1.2 (0.8-1.7) | 0.7 (0.4-1.4) | 1.0 (0.8-1.4) |
| Social class | | | | | | | | | | |
| non-manual (743) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| skilled manual (595) | 1.4 (1.1-1.8) | 1.1 (0.9-1.5) | 1.3 (0.9-1.9) | 1.3 (1.0-1.7) | 1.0 (0.6-1.5) | 1.2 (0.9-1.6) | 1.0 (0.6-1.6) | 1.1 (0.8-1.5) | 1.2 (0.7-1.8) | 1.4 (1.1-1.7) |
| unskilled and (479) | 1.6 (1.2-2.1) | 1.4 (1.0-1.8) | 1.4 (1.0-2.1) | 1.4 (1.1-1.9) | 1.0 (0.6-1.6) | 1.4 (1.0-1.9) | 1.1 (0.6-1.8) | 1.2 (0.9-1.6) | 1.2 (0.7-1.8) | 1.3 (1.0-1.6) |
| semi-skilled manual | | | | | | | | | | |

Odds ratios were derived by logistic regression analysis, all risk factors being examined simultaneously. *: cold air, household chemicals, traffic fumes or smoke; **: smoking habits were unknown for 48 subjects, and social class could not be classified for 344.

tightness on waking of any duration and chest tightness on waking that lasted at least an hour was infinite by definition). The weakest relationship was between breathlessness on exposure to cold air and cough on exposure to cold air (odds ratio = 0.9). The overall relationship between the symptoms when examined by multidimensional scaling is shown in figure 1. Responses to irritant stimuli tended to cluster according to the symptom produced (cough, breathlessness or wheeze) rather than the stimulus giving rise to the symptom. For example, wheeze on exposure to cold air was more strongly associated with wheeze in response to other irritants (odds ratios all greater than 42) than with cough or breathlessness in response to cold air (odds ratios both less than 6). In the subsequent analysis these clusters of symptoms were grouped together as were chest tightness and breathlessness in response to common allergens. Other symptoms that were strongly associated included daytime breathlessness at rest and nocturnal breathlessness on waking (odds ratio = 37.2), and wheeze and chest tightness on waking (odds ratio = 31.5). The symptoms making up the bronchial irritability syndrome, as defined by MORTAGY *et al.* [5], did not cluster together. Further details of the relationship between pairs of symptoms are given in table 2.

Table 3 shows the risk of symptoms according to sex, age, smoking habits and social class. All of the risk factors were analysed simultaneously. Social class was assigned on the basis of last full-time occupation, married women and widows being classed according to their husband's last job. Sex was not an important determinant of symptoms except for morning phlegm which was reported significantly less often by women than by men (odds ratio = 0.5, 95% CI 0.4-0.7). Wheeze, morning phlegm and chest tightness on waking were all more common at older ages, and all increased in prevalence from non- to ex- to current smokers. They also occurred more frequently in manual workers and their wives than in the non-manual social classes. A similar relationship to social class was apparent for breathlessness at rest, nocturnal breathlessness and cough in response to irritants, but unlike most other symptoms, the latter was negatively associated with age. None of the risk factors studied was clearly related to breathlessness or chest tightness on exposure to common allergens, breathlessness in response to irritants or wheeze in response to irritants. Overall, smoking was a stronger determinant of risk than the other variables analysed.

Discussion

In this survey of 2,161 elderly subjects almost 60% reported respiratory symptoms. Smoking was a more important risk factor than age, sex or social class, and was associated particularly with wheeze, morning phlegm and chest tightness on waking. Several groups of symptoms tended to cluster in the same individuals, but there was no evidence that the bronchial irritability syndrome, as defined by MORTAGY *et al.* [5], constitutes a distinct syndrome in the elderly.

We had no means of validating the symptoms which our subjects reported, but the questions that we asked were taken from two tried and tested questionnaires. In particular, the questions by which we ascertained symptoms of the bronchial irritability syndrome were identical to those used by MORTAGY *et al.* [5]. In general, any errors in the reporting of symptoms would be expected to obscure rather than exaggerate associations.

Most previous surveys of respiratory disease in the general population have concentrated on younger age groups [9-11]. When data have been presented for subjects over the age of 65 yrs [3, 12, 13], they are not directly comparable with our findings because different questions were used to ascertain symptoms. Moreover, ours was not a simple random sample, but was weighted somewhat in favour of the over 75 yrs age group. Nevertheless, the high prevalence of respiratory complaints which we have recorded is in broad agreement with two other British studies. In 1957, HIGGINS [14] reported that in a random sample selected from an agricultural community in South Wales, almost 75% of men and women aged 65-74 yrs complained of wheeze and chest tightness, phlegm or breathlessness on exertion. More recently, MILNE and WILLIAMSON [15] surveyed residents of Edinburgh aged 62-90 years. They found wheeze in 29% of men and 28% of women, and persistent cough with phlegm in 32% of men and 4% of women.

Like other investigators [16-18], we found that smoking was an important determinant of symptoms, especially wheeze, morning phlegm and chest tightness on waking. The risk of morning phlegm among ex-smokers was intermediate between that in nonsmokers and current smokers. In contrast wheeze, and chest tightness on waking occurred with much the same frequency in ex-smokers as in those who continued to smoke. This may be because the effects of smoking on the last two symptoms are less reversible than on morning phlegm. Alternatively, it is possible that some ex-smokers had given up smoking because of wheeze or chest tightness.

After allowance for other risk factors, sex was not an important determinant of symptoms except that women reported morning phlegm less often than men. A similar association was apparent in the survey of MILNE and WILLIAMSON [15] in Edinburgh, but the observation could be an artefact of biased ascertainment. It is possible that coughing up phlegm is socially more acceptable in men than in women, and they are therefore more willing to admit to the complaint.

The prevalence of several symptoms was related to age, but interpretation of this observation is complicated. The increased mortality associated with respiratory disorders must be taken into account. If people with respiratory symptoms die faster than the average, then prevalence will tend to fall with increasing age. Moreover, in cross-sectional studies the relationship of prevalence to age may also be influenced by differences in disease occurrence between successive generations. Because of the possibility of selection and cohort effects, conclusions about the relationship of incidence to age

are better drawn from longitudinal studies. Importantly, however, age differences in prevalence did not explain the associations of symptoms with other risk factors.

The relationship of symptoms to social class is of interest in view of the steep social class gradient in mortality from bronchitis, asthma and emphysema in Britain [19]. We did find a higher risk of symptoms in manual workers and their wives, but the effects of social class were generally smaller than those associated with smoking. Possible explanations include a higher incidence of occupational lung disorders in certain manual jobs, and greater exposure to air pollution in areas of poorer housing. Perhaps more importantly, a greater proportion of subjects from social classes IV and V will have been brought up in damp and crowded houses, and therefore have been more prone to respiratory infection in early life. Evidence is emerging that lower respiratory infection in infancy may be a potent risk factor for airways disease in adults [20, 21].

The main aim of the study was to establish whether or not men and women over the age of 65 yrs exhibit the bronchial irritability syndrome which MORTAGY *et al.* [5] had described in younger adults, and whether the symptoms that make up the syndrome could be used to identify treatable airways obstruction in the elderly. Examination of the interrelationship between symptoms showed a strong association between breathlessness and chest tightness in response to animals, dust or feathers. These are classical symptoms of allergic asthma [22] and would be expected to occur together. Also closely related were daytime breathlessness at rest, nocturnal breathlessness, chest tightness on waking and wheeze. The fact that these symptoms can coincide in several distinct disorders (asthma, chronic bronchitis and left ventricular failure) may explain why as a group they were less closely linked with breathlessness and chest tightness in response to allergens (features of allergic asthma only) and morning phlegm (typically a feature of chronic bronchitis). Unlike responses to allergens, reactions to irritants clustered according to the response (breathlessness, wheeze or cough) rather than the stimulus. This may have been partly a consequence of the way in which individuals interpreted the relevant questions, but it seems unlikely that subjective differences in interpretation could totally explain the phenomenon.

Overall, the symptoms of the bronchial irritability syndrome were not grouped closely together. There was no evidence, therefore, that they constitute a distinct syndrome in the elderly. Again the pattern may have been distorted by differences in the interpretation of questions. Also, an association may have been obscured by the high prevalence in the elderly of disorders other than asthma, which can give rise to symptoms that are part of the syndrome. For example, it is possible that left ventricular failure caused much of the nocturnal breathlessness reported by our subjects. In Mortagy's study only 10.8% of subjects complained of chest tightness on waking and 5.8% of nocturnal breathlessness, prevalences distinctly lower than those which we recorded.

Although the symptoms of the bronchial irritability syndrome do not appear to cluster in the elderly, they might still be useful in the detection of treatable airways obstruction. In particular, it is worth exploring the predictive value of certain combinations of symptoms that are less likely to arise from other diseases - for example, nocturnal breathlessness in association with prolonged chest tightness on waking. The relationship of symptoms to respiratory function and bronchial reactivity will be reported in a further paper.

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Enquête de population sur les symptômes respiratoires des sujets âgés. L. Dow, D. Coggon, C. Osmond, S.T. Holgate.

RÉSUMÉ: L'obstruction réversible des voies aériennes n'est pas rare chez les sujets âgés mais elle peut être méconnue en raison de la prévalence élevée d'autres maladies donnant un tableau clinique similaire. Au cours d'une recherche des types de symptômes susceptibles de prédire une obstruction curable des voies aériennes, nous avons effectué une enquête chez des hommes et des femmes de 65 ans ou davantage. Les questionnaires par voie postale ont été complétés par 2,161 sujets sélectionnés au hasard dans les listes de trois praticiens généraux. Presque 60% de l'échantillon se plaignaient d'une ou plusieurs symptômes respiratoires. Le tabagisme s'avère un facteur de risque plus important que l'âge, le sexe ou la classe sociale et est associé en particulier avec les sifflements respiratoires, l'expectoration matinale ainsi que l'oppression à l'éveil. Certains groupes de symptômes ont tendance à s'agglomérer chez les mêmes individus. Les deux symptômes les plus reliés entre eux étaient l'oppression thoracique et la dyspnée après contact avec les animaux, la poussière et les plumes. Les réponses aux irritants ont tendance à s'agglomérer selon le symptôme produit (toux, dyspnée ou sifflement), plutôt que selon le stimulus provocateur (fumée, air froid, produits chimiques ménagers ou fumée du trafic). On a pas trouvé de preuve d'existence d'un syndrome d'irritabilité bronchique qui avait été associé à l'asthme chez de plus jeunes adultes. Les relations entre les symptômes et la fonction respiratoire et la réactivité bronchique seront exposés dans une publication ultérieure. *Eur Respir J*, 1991, 4, 267-272.