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Asthma in the elderly: underperceived, underdiagnosed and undertreated; a community survey

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Bronchial asthma is now increasingly recognized in the elderly and is associated with significant morbidity and mortality. The aims of this study were two-fold: first, to assess the prevalence and, second, to evaluate diagnostic awareness, therapeutic management and patient perception of bronchial asthma among elderly patients in the community.

From the age–sex register of an urban general practice in NE England, 2004 patients aged >65 years were eligible for inclusion. Response to an initial screening questionnaire on respiratory symptomatology was 68% (n=1362). Of these, 869 patients had respiratory symptoms: 390 voluntarily agreed to be evaluated further including assessment of airway physiology. In this group 369/390 had obstructive spirometry and, of these, 95 patients fulfilled clinical and physiological criteria of bronchial asthma. Prevalence of asthma within this age cohort was minimally and rather crudely assigned at 4·5% (95/2004).

Among the 95 patients so-defined patients with asthma [age 70 ± 8 years (mean ± SD), FEV_1=0·96 ± 0·4 l, 33 male, 75 life-long non-smokers], subjective awareness, perception and attribution of pulmonary symptoms were poor. Further, despite tangible evidence of reversible and significant airflow limitation, only 21 were receiving inhaled glucocorticoid therapy (median daily dose 400 μg).

Asthma in the elderly remains poorly perceived, poorly recognized and suboptimally treated. These findings are particularly apposite in the light of current epidemiological trends in asthma mortality and morbidity in elderly age cohorts.

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Introduction

Asthma is a common disease with an overall prevalence of up to 7–8% of the general population (1). Further, there is a steady increase in the prevalence of asthma from adolescence to old age (1). A universally accepted definition, however, remains an elusive goal. Estimates of prevalence differ greatly from country to country and even within the same country because of the variable criteria employed to establish the diagnosis. The problem is compounded in older age groups because of overlap of diagnostic labels and poor patient perception of symptoms. Since Ford (2) and Lee and Stretton (3) emphasized the prevalence of the condition in elderly patients, a number of epidemiological studies have confirmed that asthma is common in the elderly (4–13). Of particular concern are statistics regarding mortality from asthma which appears to be increasing throughout the world, especially among persons aged 55 years and older (14). The increase in deaths is most marked in the older age groups. In 1990, 50% of all recorded asthma deaths in England and Wales occurred in the 65–84 year age group, and a further 10% occurred in those aged over 85 years (15). There has also been concern that asthma is underdiagnosed (3,16–19) and hence not adequately treated in the elderly. To address some of these issues, we have conducted a community survey to assess prevalence, diagnostic awareness, therapeutic management and patient perception of bronchial asthma among elderly subjects in an urban general practice in the north-east of England.

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Methods

All subjects who participated in the study gave written and informed consent which was approved by the Sunderland local research ethics committee. The study was

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of cross-sectional design. The age–sex register of an urban group general practice in the north east of England during the period October 1992–May 1993 was used to identify subjects over the age of 65. Patients so identified were sent a previously validated screening questionnaire (20) that enquired about five respiratory symptoms: (1) cough on winter mornings, (2) sputum expectoration on winter mornings, (3) wheezing or whistling in the chest, (4) shortness of breath on washing and dressing and (5) distance walked on the level before becoming short of breath. Up to two reminders were sent. Patients who responded positively to at least one symptom and who were voluntarily agreeable to further evaluation were visited at home by a trained nurse and completed the Medical Research Council (MRC) respiratory questionnaire (21) under supervision and underwent spirometric assessments.

Spirometric assessments were performed in a sitting position with a Portable Micro Medical Printer Spirometer (Micro Medical Ltd, Rochester, Kent, U.K.), which was calibrated daily before use. Airway parameters measured were (a) forced expiratory volume in 1 s (FEV_1), (b) forced vital capacity (FVC) and (c) peak expiratory flow rate (PEFR). Patients were required to perform three satisfactory spirometric techniques within 5% of each other by FVC: the best of these three manoeuvres for each of the airway parameters was recorded by the trained nurse and print-outs of the spirograms were verified by a clinician (D.C.) to confirm adequate technique. No repeatability measurements of these assessments were undertaken subsequently in any of the patients.

Bronchodilator reversibility of airflow obstruction was assessed 15 min after the inhalation of 200 μg of salbutamol from a metered-dose inhaler using a large-volume spacer device. Height and arm span were measured to the nearest centimetre and predicted values for lung function were calculated from regression equations derived from the report of the working party of the European Community for Coal and Steel (22). A diagnosis of asthma was assigned on the basis of clinical criteria: (i) daytime symptoms of episodic cough and wheeze or (ii) similar nocturnal symptoms suggestive of heightened airway reactivity supplemented with one of two objective physiologic criteria of airflow reversibility; (iii) $\geq$15% increase in FEV_1 or (iv) an absolute increase in FEV_1 or FVC $\geq$200 ml following salbutamol inhalation.

STATISTICAL ANALYSIS

Normally distributed data was assessed parametrically by the paired *t* test. Correlation between variables was assessed using Pearson's test. A *P* value of <0·05 was considered significant. Data are expressed as mean ± standard deviation (SD) unless otherwise stated.

Results

From the age–sex general practice register, 2004 patients were eligible for inclusion into the study. A total of 1362 adequately completed screening questionnaires were returned (response rate 68%). Of these, 869 patients responded positively to at least one of the screening questions and 390 of these patients agreed voluntarily to be visited at home for further assessment including physiologic evaluation. Of these 390 patients, 369 had obstructive spirometry, defined as an FEV_1/FVC ratio <70%, and, of these, 95 patients satisfied our clinical and physiological criteria for bronchial asthma.

TABLE 1(a). Spirometric measurements of those patients physiologically assessed and defined as having asthma (n=95)

Parameter	Mean (± SD)	Mean (% predicted)
FEV_1	0·96 ± 0·41	53
FVC	1·93 ± 0·71	82
FEV_1/FVC	50·6% ± 13·5%	
PEFR	120 ± 67 l min^{-1}	35

TABLE 1(b). Gender differences in spirometric measurements

Parameter	Males (n=33)	Females (n=62)	Significance
FEV_1 (% predicted)	45·6	57·0	P<0·02
FVC (% predicted)	73·4	86·8	P<0·02
FEV_1/FVC (%)	46·8	52·6	n.s.
PEFR (% predicted)	34·0	35·2	n.s.

Of the 95 patients defined as having asthma, 33 were male and 75 were life-long non-smokers. The mean age of the group was 70 ± 8 years. Spirometric characteristics of these patients are summarized in Table 1(a) with gender differences illustrated in Table 1(b). Male asthmatic patients had significantly lower FEV_1 and FVC [P<0·02, Table 1(b)].

SYMPTOMS

The majority of patients (84/95) experienced wheeze and/or chest tightness on moderate exertion. Thirteen patients were severely incapacitated and house bound because of dyspnoea. Twenty-seven patients had significant nocturnal morbidity with symptoms of wheeze, cough and chest tightness. One patient reported a worsening of asthma symptoms related to aspirin ingestion.

PATIENT PERCEPTION AND AWARENESS OF THEIR PULMONARY SYMPTOMS

Only seven patients were aware they had a clinical diagnosis of bronchial asthma. The majority (84/95) believed that asthma was not responsible for their breathlessness, and 24 perceived that there was nothing wrong with their chest.

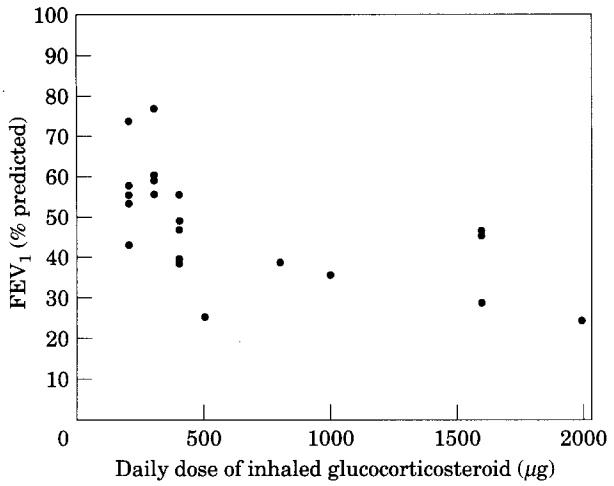

FIG. 1. Scatter plot showing daily dose of inhaled glucocorticoid (μg) versus magnitude of airflow limitation (expressed as percentage of FEV_1 predicted) in 21 patients. A modest, but statistically significant, negative correlation was observed ($r = -0{\cdot}59$); $P<0{\cdot}01$; $n=21$).

Additional patient attributions for their perceived breathlessness included cigarette smoking, 'bronchitis', dust-related pulmonary morbidity and possible cardiac pathology.

THERAPEUTIC MANAGEMENT

Of the 95 patients defined as suffering from asthma, 43 were not receiving any form of anti-asthma medication. By contrast, of the 52 patients who were receiving treatment, 39 were managed solely with inhaled therapy, three with oral therapy alone and ten with a combination of inhaled and oral medication. The majority of inhaled therapy was delivered from pressurized metered-dose inhalers.

Of those patients receiving medication, only 21/52 (40%) were being administered chronic disease modifying treatment in the form of inhaled corticosteroids (GCS). The median daily dose was 400 μg (range 200–2000 μg): only six patients were receiving daily doses of inhaled GCS $\geq 800\,\mu$g. A modest, but statistically significant, negative correlation between daily received dose of inhaled glucocorticoid and magnitude of airflow limitation (expressed as percentage predicted FEV_1) was observed ($r = -0{\cdot}59$, $P<0{\cdot}01$) and is represented in Fig. 1.

In 88 of the 95 designated asthmatic patients, their asthma therapy was classified according to current therapeutic strategies as advocated in the British Thoracic Society Guidelines for the treatment of chronic persistant asthma (23). Seven patients could not be so classified. These data in comparison with airway physiology are shown in Table 2. The majority of patients (67/88, 76%) were receiving either no treatment or merely medication for symptomatic relief. For the group as a whole, only 24% (21/88) were receiving inhaled GCS. No patient was receiving systemic corticosteroid therapy.

TABLE 2. Airway physiology compared with therapeutic management as designated by British Thoracic Society strategies (as published in 1993) for the management of chronic persistent asthma ($n=88$; seven patients could not be allocated to a therapeutic step due to lack of sufficient data)$_1$

Treatment strategy	Number of patients	Mean $FEV_1 \pm$ SD (% predicted)
No treatment	43	56·5 ± 23·7
Step 1	24	53·8 ± 23·0
Step 2	17	47·6 ± 16·9
Step 3	2	40·0 ± 10·0
Step 4	2	35·5 ± 8·2
Step 5	0	

Therapeutic treatment strategies are as follows: step 1, occasional use of relief bronchodilators; step 2, regular inhaled anti-inflammatory agents (low-dose inhaled GCS, up to 800 μg daily); step 3, high-dose inhaled GCS (up to 2000 μg daily); step 4, (high-dose inhaled GCS and regular bronchodilators; step 5, addition of regular systemic steroid medication.

Discussion

In this community-based, cross-sectional study conducted among elderly patients in an urban general practice in the U.K., we have shown that pulmonary morbidity due to respiratory symptoms is common and that physiologically demonstrable reversible airflow limitation is poorly perceived, poorly recognized and suboptimally treated. These data are particularly apposite in the light of epidemiological trends in asthma morbidity and mortality in the elderly and with the further impending revision of therapeutic strategies for the treatment of chronic persistent asthma by the British Thoracic Society.

We are nevertheless aware of a number of potential criticisms of this study. Perhaps the most significant is that the study as it stands is not a true epidemiological survey. First, the data were acquired from only one urban group general practice, not several, and thus may not have been representative of a wider catchment area. Second, while the initial response rate to the postal questionnaire was 68%, non-responders (642/2004, 32%), despite up to two reminders, were untraced. Further, of the 869 who initially responded positively to at least one screening question, only 390 agreed to further domicillary physiological assessment although this was done on a voluntary basis. It is thus clearly arguable that these 390 patients (representing only 19·5% of the potential original study population) and the subsequent 369 documented to have obstructive spirometry constituted an unrepresentative group. Indeed, a similar argument may be applied to the final 95 patients who ultimately fulfilled our clinical and physiologic criteria of asthma. The data thus have to be interpreted accordingly as the potential study population shrank at progressive stages of evaluation.

Our assignment of obstructive spirometry was an FEV_1/FVC ratio of <70%. Other studies in comparable age cohorts have utilized lower ratios (24), suggesting that our assessment of the prevalence of airflow limitation may have been significantly overestimated. Our definition of a diagnosis of asthma neverthless was applied vigorously and uniformly and was assigned on both clinical and physiological criteria. The latter included two definitions of airflow reversibility based on both percentage and absolute spirometric improvement following salbutamol inhalation. Further, we are confident of the technical validity of our spirometric assessments, although, given the cross-sectional nature of the study, repeatability of these parameters at different time points was not evaluated.

While the dose of β_2-agonist (200 μg salbutamol) used to assess airway reversibility could be considered modest and indeed may not have produced maximal bronchodilation, this potential attenuation of therapeutic effect may have been, in part, offset by our definition of airflow limitation based on a higher baseline FEV_1/FVC ratio. Even so, the patients nevertheless so identified (n=95) did have, by definition, reversible airflow limitation. Although partially reversible chronic obstructive pulmonary disease could not be unequivocally excluded, this seems unlikely given that 75 of these 95 patients were life-long non-smokers.

Epidemiological evidence has suggested that it is difficult to assign precise figures to the prevalence and incidence of asthma in the elderly in the general population because there is no universally accepted definition of the condition. However, large population studies from the United States and Europe, using self-reported symptom questionnaires and objective assessments of lung function, have provided good estimates. Despite the employment of a detailed respiratory questionnaire and objective assessments of lung function, our estimation of prevalence of asthma among the elderly in this study was limited by methodological difficulties as the initial study population diminished with progressive selection, and this was perhaps compounded by our definition of airflow limitation. Our very crude estimation of a prevalence of 4·5% (95/2004) of asthma in the elderly from the data of this study has thus to be interpreted accordingly.

A further limitation of surveys employing questionnaires is that underestimation of prevalence of asthma in the elderly may be related to impaired subjective awareness of symptomatology (19,25). Indeed, this was illustrated in our population sample, in which only seven patients were aware that they had a clinical diagnosis of the condition. It is noteworthy that of the 95 patients so identified as having asthma, 24 (25%) believed they had no pulmonary pathology, presumably as result of evolving strategies to perceive and cope with their morbidity.

Current smoking, age and non-specific airway responsiveness have been shown to be independently related to the risk of developing wheezing symptoms in older men (26). In the currently reported study, airway reactivity was not assessed, and only 20/95 defined asthma patients had a history of tobacco smoking, of whom only two were current cigarette smokers at the time of assessment. Further, earlier studies of asthma in subjects over the age of 70 years in the general population have shown men to have more severe forms of the disease (9). While this observation was confirmed in our study [Table 1(b)], the explanation is unclear but may relate in part to a number of compounding factors including previous occupational environment, previous smoking habit, disease chronicity and suboptimal therapeutic management.

Perhaps the most significant observation of this study was the magnitude of therapeutic undertreatment of the so-defined patients with asthma. This may well have been a consequence of these patients' poor expectation of health, with resignation to chronic pulmonary morbidity as an inevitable sequel *de novo* to the aging process. Allied to this, although we have no objective data to support this, their utilization of primary health care resources may have been poor despite ongoing significant pulmonary symptoms. An alternative interpretation would be that at times of interface with health care professionals, pulmonary symptoms were not appropriately recognized, addressed clinically or objectively assessed physiologically. Further, although we cannot comment directly on the co-existence of extrapulmonary pathology, this may, at least in part, have influenced both health care professionals and patients in their expectation of disease amelioration. While therapeutic compliance was not an outcome evaluated in this study, excessive morbidity in those patients prescribed therapy for asthma may have been attributed to non-compliance. Non-compliance in asthma, as with other chronic clinical conditions, is well documented, although previous studies have suggested that this is less of a problem in elderly, as opposed to younger, patients with the condition (5).

The elucidation and characterization of asthma as a chronic inflammatory condition of the human airway characterized by heightened airway responsiveness to a variety of bronchoprovocative stimuli has led to clarification of therapeutic strategies. Numerous published consensus international guidelines relating to the diagnosis and management of asthma emphasize the promotion of bronchodilatation and, most importantly, attenuation of the airway inflammatory response. Indeed, the current British guidelines on asthma management (23) advocate the early and progressive use of inhaled GCS therapy for all but the mildest of asthmatic patients. Notwithstanding the plethora of evidence-based data relating to the disease-modifying effects of these drugs in bronchial asthma (27), a particular aspect of significant therapeutic concern in this study was the observation of the low rate of prescribed inhaled GCS therapy. Despite tangible objective evidence of reversible airflow limitation in 95 patients, approximately 75% were not receiving inhaled GCS. Furthermore, within the minority of patients who were receiving inhaled GCS, daily therapeutic requirements were modest. The tacit assumption is made in view of the physiological evidence that all 95 patients so identified with variable airway calibre were potentially steroid responsive, however heterogenous the magnitude of that potential response. We are unable to comment from our data, however, given the design of the study, on whether inhaled or indeed systemic GCS therapy had previously been administered to those patients not receiving this therapy at the time of assessment, and the

documented clinical and physiological response, if any, to such an intervention. Nevertheless, the absence or perceived suboptimal treatment of these patients with inhaled GCS has significant pulmonary prognostic implications: it is exceedingly unlikely that a younger cohort of asthmatic patients with comparable reversible airflow limitation would have been so undertreated.

In conclusion, this study has clearly identified a lack of recognition and awareness of the possibility of the diagnosis of bronchial asthma in elderly patients in the community. Lack of diagnostic awareness was allied to poor patient perception of respiratory symptoms and suboptimal therapeutic management. The major implications of this study are that, irrespective of age, accurate clinical evaluation coupled with objective assessments of airway physiology should be undertaken in all patients reporting respiratory symptoms and potential disease-modifying inhaled and/or systemic therapy appropriately assessed. This is applicable to all clinicians in both primary and secondary health care provision, and particularly to those who evaluate elderly patients with respiratory symptomatology.

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