Prevalence of untreated asthma in a population sample of 6000 older adults in Bristol, UK

L Dow, L Fowler, L Phelps, K Waters, D Coggon, A L Kinmonth, S T Holgate

Abstract

Background—A study was undertaken to estimate the prevalence of untreated asthma in older adults.

Methods—A cross-sectional population based survey of 6000 men and women aged 65 years and over was performed in 21 general practices in north Bristol, southwest England. The main outcome measure was untreated asthma as defined by a two-stage process comprising a respiratory questionnaire (symptoms suggestive of asthma or doctor diagnosed asthma not receiving respiratory treatment) followed by lung function tests (significant reversibility following bronchodilators or corticosteroids and/or significant within day variability in peak expiratory flow).

Results—4792 of the 6000 participants (80%) completed the respiratory questionnaire and, of those not receiving respiratory treatment, 55 reported a previous doctor diagnosis of asthma and a further 696 had symptoms suggestive of asthma. Lung function testing in 280 of 501 randomly selected individuals from these groups resulted in 38 being defined as having asthma and an estimated population prevalence for untreated asthma of 2.4% (95% CI 1.6% to 3.6%) in men and 1.2% (95% CI 0.7% to 2.1%) in women. Most subjects (84%) with untreated asthma had moderate or severe disease. Untreated asthma was most common in individuals with doctor diagnosed asthma (21%) and those with breathlessness or wheeze (13–20%).

Conclusion—Untreated asthma in the elderly is a common and important problem. Opportunistic use of appropriate lung function tests in older people with a history of doctor diagnosed asthma or wheeze or breathlessness at rest could identify untreated asthmatics that might benefit from treatment.

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Keywords: asthma; elderly; treatment

Underdiagnosis of asthma has been reported in children and young adults1, 2 but little is known about the completeness with which the disease is recognised and treated in older subjects. Diagnosis may be more difficult in the elderly because of the high prevalence of other disorders such as left ventricular failure that can have similar symptoms, and because airflow obstruction is often caused by chronic obstructive pulmonary disease that has limited reversibility. However, where asthma is correctly identified, there is now a wide range of treatments available including new orally administered disease modifying drugs such as leukotriene antagonists that may be particularly useful in some older patients who experience difficulty in using inhalers.3 4

To assess the prevalence and severity of untreated asthma in an elderly population, we carried out a community based cross-sectional survey in south west England.

Methods

The study population comprised 27 809 men and women aged 65 years and older (men 6585 aged 65–74 years, 5001 aged 75+; women 7630 aged 65–74 years, 8593 aged 75+) who were registered with 21 general practices in the north Bristol area. The area served by the practices included inner city, semi-rural, and rural districts. From the age-sex registers of the practices we selected a stratified random sample of 6000 individuals comprising approximately equal numbers of men and women aged 65–74 years and 75 years or older.

Each individual was sent a postal questionnaire about respiratory symptoms in the past year, previous medical history, use of medication, smoking habits, and last full time occupation (or, for married women and widows, that of their husbands).5 6 Non-responders were sent a single reminder after 4 weeks.

From the questionnaire we identified those men and women who were not currently receiving treatment for respiratory disorders (where there was doubt about the treatment being used this was checked with the participant). Within this group we then selected for further investigation all of those who reported that at some time they had been diagnosed as having asthma by a doctor, and a random sample of those with no past diagnosis of asthma but with symptoms suggestive of the disease. These symptoms were classified into five mutually exclusive groups (table 1) and sampling fractions were chosen to ensure adequate representation of each group.

Those participants who agreed to further investigation were visited at home by one of two respiratory research nurses (LF or LP) for
assessment of lung function. Spirometric tests were carried out in the sitting position with a Vitalograph alpha desktop flow sensing spirometer (Vitalograph Ltd, Buckingham, UK) that was calibrated daily. Forced expiratory volume in one second (FEV₁) and forced vital capacity (FVC) were recorded as the highest measured values, provided the FEV₁ was within 100 ml and 5% of a second reading. Airflow obstruction was defined as an FEV₁/FVC ratio of 70% or lower or, if FVC could not be measured satisfactorily, an FEV₁ below 70% of that predicted for the individual’s age, height, and sex according to the formula published by the European Respiratory Society. If spirometry indicated airflow obstruction, it was repeated 15 and 40 minutes after concurrent inhalation of 200 µg salbutamol and 40 µg ipratropium bromide. Reversibility was defined as an increase in FEV₁ of at least 15% and at least 200 ml.

As well as spirometry, all participants were invited to carry out serial peak expiratory flow (PEF) measurements over a period of 2 weeks. For this purpose a Vitalograph peak flow meter was used with a visually enhanced scale especially adapted for the project by the manufacturer after advice from the medical director of the Royal National Institute for the Blind. Three measurements were recorded early in the morning and three in the evening. From each triplet of measurements we selected the highest value, provided that it was within 20 l/min of the second highest reading. Daily PEF variability was assessed where satisfactory recordings had been made morning and evening on at least 5 days. It was calculated as (PEFₘₐₓ – PEFₘᵢₙ)/PEFₘₐₓ and expressed as a percentage. PEF variability was deemed significant if it was 20% or higher on one or more days.

At the end of the period of peak flow monitoring, participants who had shown airflow obstruction on spirometric testing but no bronchodilator reversibility and no PEF variability were invited to undergo a trial of oral prednisolone (30 mg/day) for 2 weeks. If participants refused oral prednisolone, inhaled fluticasone 1 mg daily via a volume spacer was used as an alternative. Reversibility was considered to be present if repeat spirometric tests showed an increase in FEV₁ of at least 15% and at least 200 ml.

Individuals were considered to have asthma if they had significant PEF variability or reversibility following bronchodilators or corticosteroids. Data were analysed with the Statistical Package for Social Sciences (version 9). Prevalence rates of reported use of treatment for airways disease and of untreated asthma were estimated with adjustment for differences in sampling fractions where appropriate. Confidence intervals (CI) for prevalence estimates were based on the normal or Poisson distributions according to whether or not the underlying observed number of cases exceeded 40. The severity of untreated asthma was based on PEF variability and FEV₁, expressed as a percentage of predicted values according to internationally agreed criteria.

Ethical approval for the study was obtained from Frenchay and Southmead local research ethics committees.

### Results

Questionnaires were returned by 4792 (80%) of the 6000 subjects to whom they were sent. Their ages ranged from 65 to 104 years (median 74 years) and 2433 (51%) were women. Seven hundred and eight (14.6%) indicated that they had used bronchodilators, corticosteroids, or sodium cromoglycate for respiratory disease. Of the remaining 4084, 55 reported a doctor’s diagnosis of asthma at some time and a further 696 reported symptoms suggestive of asthma. In addition, 1566 had other respiratory symptoms such as cough and phlegm, and 1767 had no respiratory symptoms.

A total of 501 participants were randomly selected for lung function tests, of whom 280 (56%) completed spirometric and/or serial PEF measurements. Table 2 shows the distribution of these men and women according to their symptoms and history of diagnosed asthma. The reasons for failure to complete lung function tests were refusal (n=129), illness (n=34), death in the interval after completing the questionnaire (n=9), change of residence or general practice (n=8), and difficulty with the measurement techniques (n=41). Corticosteroid trials were completed by 21 (12 oral and nine inhaled treatment) of 41 eligible individuals. Of the remainder, seven agreed but withdrew before completion because of minor side effects, six refused, and seven had contraindications.

### Table 2 Numbers of subjects tested for asthma according to medical history and symptoms

<table>
<thead>
<tr>
<th>Medical history and symptoms</th>
<th>Responded to questionnaire</th>
<th>Selected for testing</th>
<th>Tested for asthma</th>
<th>Method of testing</th>
<th>Spirometry and bronchodilators</th>
<th>Serial PEF</th>
<th>Corticosteroid trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using bronchodilators, corticosteroids or sodium cromoglycate</td>
<td>708</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Not using medication for asthma</td>
<td>Previous doctor diagnosed asthma</td>
<td>55</td>
<td>55</td>
<td>34</td>
<td>27</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td>Symptom group 1</td>
<td>448</td>
<td>287</td>
<td>154</td>
<td>118</td>
<td>124</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Symptom group 2</td>
<td>36</td>
<td>25</td>
<td>15</td>
<td>13</td>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Symptom group 3</td>
<td>59</td>
<td>35</td>
<td>19</td>
<td>14</td>
<td>16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Symptom group 4</td>
<td>19</td>
<td>15</td>
<td>9</td>
<td>8</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Symptom group 5</td>
<td>134</td>
<td>84</td>
<td>49</td>
<td>42</td>
<td>44</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Other respiratory symptoms</td>
<td>1566</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>No respiratory symptoms</td>
<td>1767</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4792</td>
<td>501</td>
<td>280</td>
<td>222</td>
<td>226</td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>
prevalence of untreated asthma was 1.7%
Prevalence of untreated asthma in older adults

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Although this might have increased the healthy elderly subjects without airways disease, this approach may identify a proportion of (1.2%, 95% CI 0.7% to 2.1%), the di
tinction.13 14 Gannon and colleagues have shown that significant PEF variability will be found without bronchodilator reversibility testing on one occasion and use of higher dose bronchodilators. Performing reversibility testing on more than one occasion and use of higher dose bronchodilators can increase the number of subjects found to have reversible airflow obstruction.15 16 Gannon and colleagues have shown that significant PEF variability will be found more frequently in subjects in whom PEF is measured at least four times daily compared with twice daily as in this study.15 This may have resulted in a degree of underestimation of the prevalence of untreated asthma within our sample.

Most other studies in this age group have concentrated on undiagnosed asthma whereas we chose to look at untreated disease. It is unclear why some patients with diagnosed asthma and ongoing disease were not on treatment. Some may have had asthma that remitted and then recurred. Others may have stopped treatment.

Our results agree with those of a recently performed study in Lincolnshire, UK in which undiagnosed asthma was found in 2.2% of a single practice random sample of 353 patients aged 60–75 years.16 This study had a similar protocol for lung function testing. Individuals who were identified as having newly diagnosed asthma in that study were not considered to have severe disease as measured by pulmonary function and health status assessment. In contrast, in our larger community sample of untreated asthmatics, using a different approach to assess asthma severity, 84% of our cases had moderate or severe disease. As with other studies that have examined the prevalence of untreated asthma in older people, we found that investigation of many untreated individuals with symptoms suggestive of asthma failed to show airflow limitation on lung function testing.15 17 The causes of their symptoms are unclear but a proportion may have had cardiace disease or transient symptoms related to infections.

The costs of screening for untreated asthma were not evaluated in our study, but a Dutch investigation has estimated that the identification of new cases of asthma or chronic obstructive pulmonary disease in an adult population subjected to a screening programme cost $500–1000 per case.18 We found that the prevalence of untreated asthma was higher in men than in women, particularly in the older age group (75+). There is some evidence that, in men and women with similar symptoms suggestive of asthma, men are less likely to receive a label of asthma and more likely to be considered as having smoking related airways disease.19 20

Our results should help general practitioners to identify patients who are most likely to benefit from lung function testing. They suggest that, in older adults with a past diagnosis of asthma and/or current wheeze or breathlessness at rest, about 15–20% may have asthma. Uncontrolled asthma is considered to account for a significant proportion of health care spending on the frequent exacerbations requiring emergency primary or secondary care.21 Appropriate treatment and monitoring of asthma should result in health gains. Our results do not suggest that large scale screening for untreated asthma in elderly people is likely to be cost effective. Case finding among those at high risk and therapeutic trials of treatment would seem to be a more efficient approach deserving formal evaluation.

Future research should focus on defining the pattern of risk factors that best predicts untreated asthma, and on understanding the patient, practitioner, health and social factors that may contribute to the phenomenon.
The authors thank the participants and staff from the North Bristol general practices for the considerable help and support with this research, Dr Sarah Keir for her help in medical assessment prior to corticosteroid trials, and Jason Poole who helped with the statistical analysis.

LD led the development of the idea for the research and research design, participated in data collection, analyses, and writing up of the paper, and is the main guarantor for the study; LP and LP participated in the data collection; KW led data coding and analysis; DC participated in the development of the idea for the research, research design, data analysis, and interpretation and writing up of the paper; ALK and STH participated in the development of the idea for the research, the sampling strategy, interpretation of results, and writing up of the paper.

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Conflicts of interest: LD, LF, LP have received educational grants to support primary and applied respiratory meetings and sponsorship of educational courses. Dow, Fowler, Phelps, et al. 476


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