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ORIGINAL RESEARCH

The prevalence of dysfunctional breathing in adults in the community with and without asthma

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Summary Functional breathing problems, including symptomatic hyperventilation, may impair quality of life. Symptoms associated with functional breathing disorders have been reported as being common in secondary care settings, and can affect 29% of adults with current asthma in the community. The prevalence of dysfunctional breathing in the general adult population is unknown.

The Nijmegen Questionnaire has been reported to have useful sensitivity and specificity for diagnosing dysfunctional breathing. A cross-sectional postal survey of adults without current asthma was undertaken in a single UK general practice. The results were analysed in conjunction with a previously described survey of adults with current asthma from the same population.

The questionnaire was posted to a random sample of 300 people aged 16—65 without current asthma, and 69% were returned. 8% (95% confidence intervals 4—12%) had positive screening scores. Positive screening scores were more common in women (14%, 7—20%) than men (2%, 0—5%, $p = 0.003$). Comparison with the previous survey showed that the prevalence of positive screening scores was higher in those with current asthma than those without (29% vs. 8%, $p < 0.001$).

Dysfunctional breathing may affect up to one in 10 people, and is more common in women and in people with asthma.

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Introduction

Functional breathing problems have been shown to result in significant morbidity, including respiratory symptoms such as breathlessness, chest tightness and chest pain, and non-respiratory symptoms including anxiety, light headedness and fatigue [1,2]. Because people frequently overbreathe or have an increased respiratory rate, this syndrome is often called the "hyperventilation syndrome". Nevertheless, people may exhibit other breathing abnormalities, such as unsteadiness and irregularity of breathing [3–5], frequent sighing [4] and a predominantly non-diaphragmatic respiratory effort [1]. Other diagnostic terms have been applied to people with symptoms produced by abnormal breathing, including 'dysfunctional breathing' [6].

The prevalence of functional breathing disorders in the community is not known accurately. We have recently reported a high prevalence of symptoms compatible with dysfunctional breathing in adults treated for asthma in the community [7] with 29% of people having positive screening scores using the Nijmegen Questionnaire [8]; over half showed a clinically relevant improvement in their disease-related health status following a short physiotherapy-based breathing retraining programme [9].

This study uses the Nijmegen Questionnaire (Table 1) to investigate the prevalence of symptoms suggestive of dysfunctional breathing in adults without asthma, and compares this with the results from the previously published survey [7] on prevalence of symptoms in adults with asthma.

Methods

This study has a cross-sectional design. We identified 4381 adults, aged 17 to 65, from the medical records of a UK semirural general practice of 7033 patients which uses a computerised clinical and prescribing software system (EMIS, Egton Medical Information System version 2.3.0). 307 people had current asthma (defined as a clinical diagnosis of asthma and receipt of one or more prescriptions for inhaled or oral bronchodilator or prophylactic asthma medication in the previous year) and the other 4,074 did not have asthma.

A cross-sectional survey using the Nijmegen Questionnaire was performed on the adults with current asthma [7]. The Nijmegen Questionnaire is a self-complete screening instrument, and a score of $\geq$23 has a reported sensitivity of 91% and specificity of 95% for the diagnosis of symptomatic hyperventilation [8]. A subsequent survey was performed 12 months later on a random sample of 300 of the 4,074 people without current asthma using the same questionnaire. A random sample was generated automatically using the facility incorporated in the EMIS software system. The questionnaire was posted to these 300 people for them to self-complete and return, together with a covering letter explaining that a survey was being undertaken of symptoms associated with breathing problems in people with and without asthma. A Nijmegen score $\geq$ 23 was used as a positive screening score. Age and sex were obtained from the patient records. Results from the two surveys were compared.

Table 1 Nijmegen Questionnaire (Please ring the score that best describes the frequency with which you experience the symptoms listed below).

	Never	Seldom	Some-times	Often	Very Often
Chest pain	0	1	2	3	4
Feeling tense	0	1	2	3	4
Blurred vision	0	1	2	3	4
Dizziness	0	1	2	3	4
Confusion or loss of touch with reality	0	1	2	3	4
Fast or deep breathing	0	1	2	3	4
Shortness of breath	0	1	2	3	4
Tightness across chest	0	1	2	3	4
Bloated sensation in stomach	0	1	2	3	4
Tingling in fingers and hands	0	1	2	3	4
Difficulty in breathing or taking a deep breath	0	1	2	3	4
Stiffness or cramps in fingers and hands	0	1	2	3	4
Tightness around the mouth	0	1	2	3	4
Cold hands or feet	0	1	2	3	4
Palpitations in the chest	0	1	2	3	4
Anxiety	0	1	2	3	4

Table 2 Nijmegen screening questionnaire results in subjects with and without current asthma (percentages with positive screening scores, 95% Confidence Intervals, CI).

	% of mailings returned	% (95% CI) of subjects with positive screening	Mean age (95% CI) of subjects with positive screening scores	% (95% CI) of male subjects with positive screening	% (95% CI) of female subjects with positive screening scores
Asthma	71	29 (23—35)	44.8 (14.7)	20 (11—28)	35 (27—43)
Non asthma	69	8 (4—12)	44.3 (13.2)	2 (0—5)	14 (7—20)

The study was approved by the local research ethics committee.

Data was entered on a computerised spreadsheet and analysed using standard SPSS software. Sex difference in the positive and negative screening groups was compared using chi-squared test. Age difference was analysed using Students *t* test. Descriptive statistics are presented as proportions with 95% Confidence Intervals (CI) and as means with Standard deviation (SD). The prevalence of positive screening scores between people with and without asthma was compared using the Mann-Whitney U-test.

Results

Of the 300 mailings, 208 questionnaires (69%) were returned and were suitable for analysis. 98 respondents (47%) were male, and the mean age was 46.6 years, standard deviation (SD) 12.2 years. The characteristics of subjects with positive screening scores in the two surveys are shown in Table 2.

17 subjects (8%) scored ≥ 23. More women (15/110, 14%) than men (2/98, 2%) had positive screening scores of ≥ 23 (chi squared = 9.0, df = 1, $p = 0.003$) (Fig. 1). The mean age of those scoring ≥ 23 (44.3 years, SD 13.2) was not significantly different from those scoring <23 (46.8 years, SD 12.1), (difference 2.5 years, standard error of difference 3.3 years, $p = 0.46$).

In comparison with the previous survey of people with asthma from the same population, the prevalence of positive screening scores was higher in those diagnosed and treated for asthma (29%) than in those with no diagnosis of asthma (8%), $p < 0.001$ (Mann-Whitney U-test) (Fig. 2).

With a prevalence of positive screening scores of 29% in people with treated asthma (comprising 7% of adult population) and 8% in people without current asthma (comprising 93% of adult population), the estimated prevalence of positive screening scores in the overall adult population was $(8 \times 0.93) + (29 \times 0.07) = 9.5\%$.

Discussion

This study demonstrates that a significant minority (9.5%) of adults in the community have symptoms suggestive of dysfunctional breathing (positive Nijmegen Questionnaire screening scores), and that up to one in 10 adults may be experiencing potentially treatable symptoms and impairment of their quality of life.

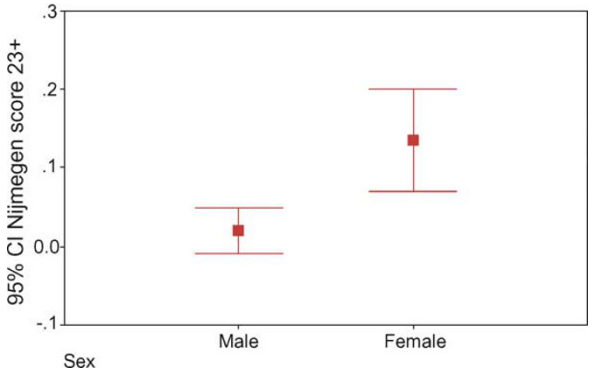

Figure 1 Proportion of positive screening scores by sex in patients without current asthma.

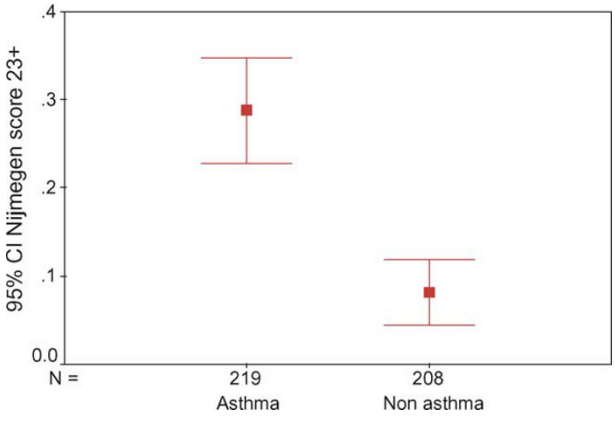

Figure 2 Proportions of positive screening scores in asthma and non-asthma patients.

We have previously reported that positive Nijmegen Questionnaire screening scores are found in over 25% of asthma patients in the community [7]. Although the Nijmegen questionnaire was validated as a screening tool for the diagnosis of symptomatic hyperventilation in a general population and not in asthmatic populations, the demonstration that over 50% of these asthmatic patients experienced a clinically relevant improvement in their asthma-related quality of life following a brief breathing-retraining intervention [9] supports the validity of the questionnaire tool in recognising potentially treatable dysfunctional breathing in patients with asthma. In the subsequent survey reported here from a general primary care population, a group in whom the questionnaire has been validated, we found approximately one in 10 patients had positive screening scores. Positive screening scores are therefore three times as common in people diagnosed and treated for asthma, and are more common in women than men.

The Nijmegen Questionnaire [8] (Table 1) is a simple-to-use symptom-based questionnaire evaluating the frequency of 16 symptoms commonly associated with symptomatic hyperventilation and dysfunctional breathing; it is a practicable tool in community settings as part of a general patient assessment. Since all these symptoms are non-specific and common to other disease processes, it is always necessary to consider other diagnoses and to investigate where appropriate, although the diagnosis can only be confirmed by a clinical improvement in response to successful breathing modification. The questionnaire does, however, identify people with a characteristic constellation of symptoms, including respiratory and non-respiratory complaints, and has been reported to have sensitivity and specificity of >90% as compared with other diagnostic methods for the 'hyperventilation syndrome' [8]. The reliability, validity and responsiveness of the Nijmegen Questionnaire (as a patient-centered diagnostic and outcome measure) as compared with ideal criteria [10] is currently incompletely described. Difficulties in validation arise from the lack of a simple 'gold-standard' diagnostic test to confirm or refute dysfunctional breathing. We have provided evidence of useful predictive validity and criterion validity (from the correlation of changes in Nijmegen Questionnaire scores with changes in disease-related quality of life) in previous work [9].

This survey occurred in a single UK general practice population, and the practice demographic profile is similar to other UK general practice populations. The response rates (of approximately 70%) in both of the surveys were reasonable and typical of such general practice postal surveys. The practice provides structured asthma care with an asthma clinic and a trained asthma nurse, but this is common in the UK. There is no reason to believe that the surveyed population or the delivery of care is atypical, although larger surveys would be needed to confirm this. This survey occurred in the same general practice population as the earlier asthma survey, and the demographic profiles of patients sent and returning questionnaires were similar in both surveys. This survey occurred 12 months after the earlier survey, and so occurred at the same time of year. Although the two groups were not surveyed simultaneously, there is no evidence of any difference between the groups other than the diagnosis of asthma, and no reason to suspect that significant demographic or morbidity change had occurred in this population over the 12-month period.

The reasons why symptoms suggestive of dysfunctional breathing should be more common in people with asthma than those without are uncertain. Possible explanations include: misdiagnosis of asthma in people with respiratory symptoms resulting from other causes; the increased prevalence of heightened anxiety and panic disorder observed in people with asthma [11]; abnormal respiratory patterns resulting from difficulties in breathing experienced by people with asthma; and potential pathogenic inflammatory effects of over-breathing [12]. Further studies are needed to confirm and elucidate this observation.

Intervention studies of breathing-retraining have indicated that non-pharmacological treatment can be used successfully to treat dysfunctional breathing in people with asthma [9] and without asthma [13,14]. None of the people identified in these surveys had previously received a diagnosis of dysfunctional breathing nor had they received any treatment for it. This finding suggests that there may be an unmet need in the community, with people experiencing symptoms that may potentially be helped by a simple non-pharmacological treatment.

In summary, we found that symptoms suggestive of dysfunctional breathing are not uncommon in adults in the community, particularly in women, and are three times as common in adults with asthma than in those without.

Funding

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Conflict of interest

None.

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