

Snoring, asthma and sleep disturbance in Britain: a community-based survey

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Snoring, asthma and sleep disturbance in Britain: a community-based survey. M.F. Fitzpatrick, K. Martin, E. Fossey, C.M. Shapiro, R.A. Elton, N.J. Douglas. ©ERS Journals Ltd 1993.

ABSTRACT: A questionnaire was sent to a random sample of adults in eight locations throughout Britain, to investigate the prevalence of snoring, asthma and sleep complaints in community-based British adult.

Of the 1,478 respondents (831 females, 647 males; mean±SD age 45±18 yrs), 37% reported snoring at least occasionally, and 11% reported snoring on at least four nights per week (frequent snorers). Frequent snorers reported spending less time asleep at night, falling asleep accidentally during the day more often, taking planned daytime naps, and falling asleep whilst driving or operating machinery more often than the other respondent. Using ordinal logistic regression analysis to allow for the age and sex of the respondents, both accidental daytime sleep and planned daytime naps were commoner in frequent snorers than other respondents.

Six percent of all respondents and 6% of those aged under 40 yrs reported that they had asthma (asthmatics). Seven percent of respondents aged less than 40 yrs reported wheezing on three or more occasions per year, and had been prescribed oral or inhaled bronchodilators (young wheezers). More than 80% of the asthmatic respondents of all ages, and young wheezers, reported waking at night with wheeze at least occasionally, and more than 30% of each group reported this symptom frequently. A larger proportion of asthmatics and young wheezers reported that their night-time sleep was unrefreshing, and that they had too little sleep at night than the other respondents. A higher prevalence of frequent snoring was reported among asthmatics under 40 yrs, and among young wheezers, compared to other respondents under 40 yrs, and this could not be explained by differences in body mass index between the groups. These differences in sleep quality were independent of effects of age and sex.

We conclude that the prevalence of snoring is similar in Britain to that reported in other countries, and that asthmatics and young wheezers have a higher prevalence of frequent snoring than non-asthmatic adults.

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A clinical history of regular snoring, unrefreshing nocturnal sleep, and daytime somnolence, is characteristic of the sleep apnoea/hypopnoea syndrome (SAHS) [1]. Around 30-50% of adult habitual snorers have been reported to have the SAHS in an Italian study [2]. However, the prevalence of snoring in the British population is unknown. Snoring is at one end of a spectrum, the other end of which is SAHS [2]. It has been suggested that sleep apnoea may be uncommon in Britain [3]. We have, therefore, investigated the prevalence of snoring, and the relationship between snoring and daytime somnolence, in a British population.

Most patients with asthma attending a general practitioner or hospital clinic have nocturnal symptoms at least occasionally [4, 5]. Nocturnal airway narrowing results in poor sleep quality [6]. It has recently been reported that both snoring and sleep apnoea may precipitate nocturnal airway narrowing in asthmatics [7, 8], but the prevalence of snoring and sleep apnoea in asthmatics is unknown. We have, therefore, also examined the fre-

quency of snoring and daytime somnolence in a random sample of community-based asthmatics.

Methods

A 15 page questionnaire, consisting of 92 questions, was sent by mail to 500 subjects at each of the following eight locations: Lerwick, Thurso, Aberdeen, Ayr, Leeds, Coventry, Southampton and St Helier. Addresses were selected at random from the local telephone directory at each location and a questionnaire sent to each, with the request that it be completed by the youngest adult aged 18 yrs or over in the household. The principal purpose of the questionnaire was to examine the relationship between seasonal affective disorder and latitude, and only 20 of the 92 questions related to asthma, snoring or sleep.

Nocturnal sleep quality was assessed by the questions: "How many hours do you sleep each night, on average?"

Table 1. — Breakdown of respondents

Group	n	Age yrs mean±SD	Females %	Males %
All ages				
Asthmatics	89	44±18	6	6
Frequent snorers	166	48±15	7	16
Under 40 yrs				
Asthmatics	39	27±6	5	9
Frequent snorers	49	29±6	5	9
Young wheezers	49	26±5	7	7

"How frequently do you feel, in the morning, that your night's sleep was refreshing?"; "Generally, do you get too much, the right amount, or too little sleep at night?"

Daytime sleepiness was assessed by the questions: "How often do you deliberately take a nap during the day?"; "How often do you fall asleep accidentally during the day?"; and "Have you ever fallen asleep while operating machinery or driving - if so, how often?"

Subjects were asked "How often do you snore loudly during sleep?" and the answer graded as: every night; 4 or more nights per week; 1 to 3 nights per week; a few times per month; never; and not sure. Respondents who reported snoring on four or more nights per week were labelled "frequent snorers" (table 1).

Subjects were asked, "Do you suffer from asthma?"; as this question has been found to relate most closely to the need for medical treatment of variable airflow obstruction [9]. In relation to asthma, they were also asked questions relating to the frequency of wheezing, age of onset of wheezing, and oral and inhaled bronchodilator or steroid medication. Respondents who claimed to have "asthma" were categorized as "asthmatics". Those who were aged less than 40 yrs, who wheezed 3 or more times per year, and were taking oral or inhaled anti-asthma treatment, were labelled "young wheezers", irrespective of whether or not they stated that they had asthma.

Nocturnal asthma symptoms were evaluated by two questions: 1) "Do you waken during the night with wheeze or chest tightness?"; and 2) "Do you have chest tightness in the morning?". Answers to both of these questions were graded as: often (more than 20 times per year); sometimes (between 3 and 20 times per year); rarely (no more than twice per year); and never.

Statistical analysis

The significance of differences in ordinal data between two groups was tested with the Mann-Whitney U test. Chi-squared significance testing was used when analysing character data in two by two tables. Student's t-test was used to analyse the significance of differences in the mean values of continuous numeric data between two

groups. Ordinal logistic regression was used to define the important, independent predictors of impaired subjective nocturnal sleep quality, and daytime sleepiness, and to estimate odds ratios by calculating exponentials of the regression coefficients.

Results

One thousand four hundred and seventy eight people, mean±SD age 45±18 yrs (831 females; 56%), returned completed questionnaires, a 37% response rate. The response rate was similar from the different locations. Six hundred and ninety nine respondents were aged less than 40 yrs (29±6 yrs), of whom 392 (56%) were female.

Snoring and sleep

Thirty seven percent of all respondents reported snoring at least occasionally, and 11% said that they snored on at least four nights per week (16% males, 7% females; $p<0.001$). Fifteen percent of respondents aged 40 yrs or more reported snoring on four or more nights per week (23% males, 9% females; $p<0.001$), as did six percent of those under 40 yrs (9% males, 5% females; $p=0.05$).

"Frequent snorers" reported shorter sleep periods, ($p<0.01$), falling asleep accidentally during the daytime more often ($p<0.01$), taking more planned naps ($p<0.01$), and falling asleep more often whilst driving or operating machinery ($p<0.01$), than other respondents (fig 1). There was no difference between the "frequent snorers" and other respondents in the response to the following questions: 1) "How many nights per week do you awaken feeling refreshed?"; 2) "Generally speaking, would you say that you got the right amount of sleep, too much, or too little sleep?"; and 3) "How often do you drink alcohol within an hour of going to bed at night?"

Ordinal logistic regression, incorporating the age and sex of the respondents, showed that snoring was an independent predictor of falling asleep accidentally during the daytime ($p<0.05$), and for planned napping ($p<0.05$), but not of the other sleep variables. Table 2 shows odds ratios (OR) estimated from the ordinal logistic regression as the ratio of the odds of the frequent snorer being above any given boundary in the ordinal classification to the odds for an infrequent snorer.

Post hoc we have found an increased rate of smoking amongst frequent snorers (32%) compared to infrequent snorers (23%; $p=0.02$). Also, body mass index was higher in snorers than non-snorers ($p<0.001$).

Asthma, wheezing and sleep

Six percent of all respondents stated that they had asthma, as did a similar proportion in the under 40 yrs age-group (table 1). Seven percent of respondents aged less than 40 yrs reported wheezing on three or more occasions per year, and had been prescribed oral or inhaled bronchodilators.

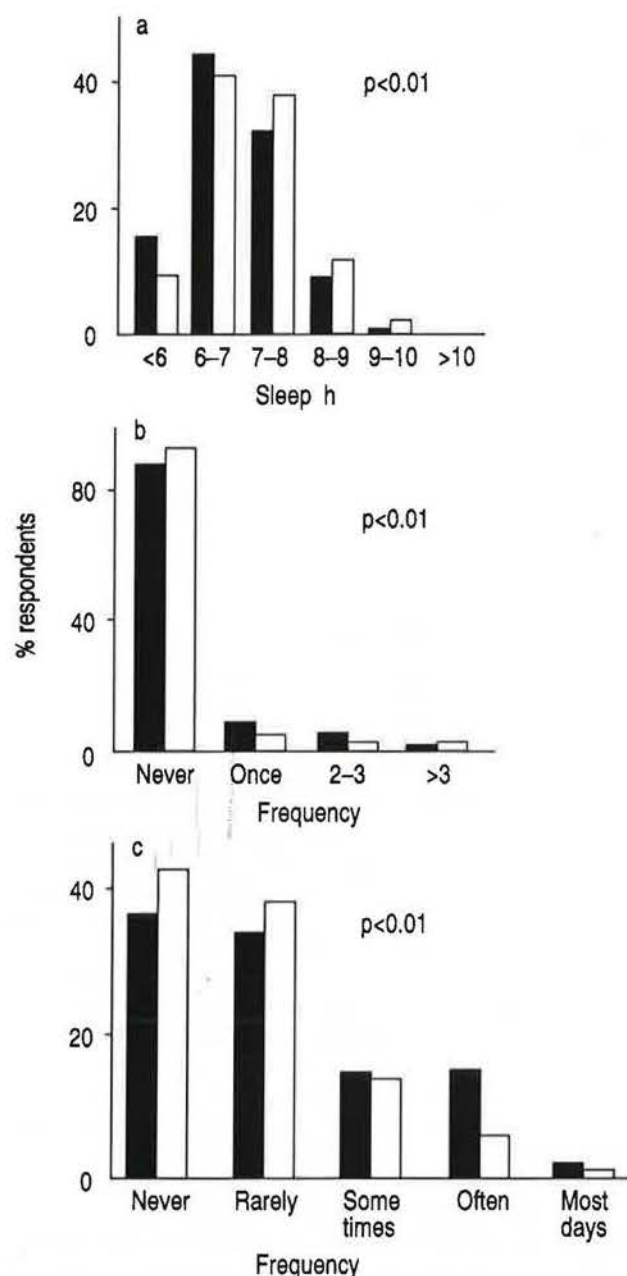


Fig. 1. — Percentage respondents of all ages in answer to the questions: a) How many hours sleep do you get each night on average?; b) How often have you fallen asleep while driving or operative machinery?; c) How often do you fall asleep against your will on average? ■: frequent snorers; □: other respondents.

Asthmatics

Eighty five percent of respondents of all ages who stated that they had "asthma", reported waking at night with wheeze at least occasionally, and 31% did so frequently (more than 20 times per year). Eighty two percent of asthmatics reported chest tightness on waking, at least occasionally, and 35% reported this symptom frequently. Asthmatics of all ages found their sleep unrefreshing more often than the other respondents ($p < 0.0001$; fig. 2). This group also snored more often

($p < 0.01$; χ^2 8.7), and a higher proportion of "asthmatics" (39%) than other respondents (29%; $p < 0.01$), claimed to get too little sleep. On ordinal logistic regression, incorporating age, sex and snoring history, asthma was a positive independent predictor of unrefreshing nocturnal sleep ($p < 0.01$), spending less time asleep at night ($p < 0.05$), and having "too little sleep at night" ($p < 0.05$). Odds ratios are shown in table 2.

Table 2. — Odds ratios (95% confidence limits) for the first-named group relative to the second-named group, of responding more in the direction indicated for each factor

Duration of sleep factor	Snorers vs non-snorers adjusted for age and sex	Asthmatics vs non-asthmatics adjusted for age, sex and snoring
Less often refreshing	1.28 (0.94–1.75)	2.03 (1.28–3.23)
Too much sleep	1.07 (0.74–1.54)	0.59 (0.35–1.00)
More planned napping	1.36 (1.01–1.85)	1.54 (0.97–2.45)
More accidental sleep	1.50 (1.09–2.05)	1.01 (0.63–1.63)
More sleep while driving	1.54 (0.90–2.66)	0.32 (0.07–1.39)
More hours of sleep	0.77 (0.56–1.06)	0.58 (0.36–0.94)

"Asthmatics under 40 yrs"

These respondents had fewer refreshing nights sleep ($p < 0.001$), and contained a higher proportion (29%) of "frequent snorers", than other respondents under 40 yrs (9%; $p < 0.001$; χ^2 11.2). No significant difference was found between these young asthmatics and other respondents under 40 yrs in reported daytime sleepiness.

"Young wheezers"

Nocturnal asthma symptoms were also commonly reported by the "young wheezers": 84% of them reported awakening with wheeze at least occasionally, and 33% woke often (more than 20 times per year) because of asthma. Ninety percent of the "young wheezers" had morning chest tightness at least occasionally, and 39% reported this as a frequently occurring symptom. "Young wheezers" found their sleep unrefreshing more often ($p < 0.0001$; fig. 2), and a higher proportion of this group (56%) felt that they got too little sleep on average than did the other young respondents (35%; $p < 0.01$). More of the young wheezers were frequent snorers (14%) than the other respondents under 40 yrs of age (5%; $p < 0.01$; χ^2 9.1). This increased prevalence of frequent snoring in the young wheezers was seen despite the fact that the body mass index tended to be lower in the "young wheezers" (mean 22.9 kg·m⁻²) than in the other respondents under 40 yrs (mean 24.4 kg·m⁻²; $p < 0.06$); and was no different in the frequent snoring young wheezers (mean 25.2 kg·m⁻²) as compared with other respondents under 40 yrs (mean 24.3 kg·m⁻²; $p = 0.24$). There was no significant difference between young wheezers and other respondents in the tendency to fall asleep accidentally during the day ($p = 0.9$), or in the frequency of falling asleep whilst driving or operating machinery ($p = 0.3$).

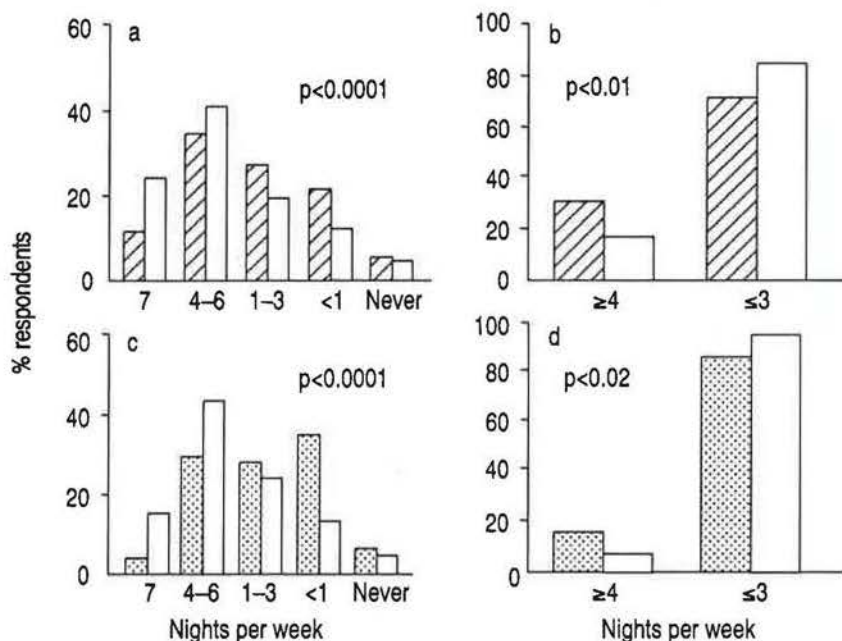


Fig. 2. — Percentage respondents under 40 yrs in response to the questions; a) and c): How frequently do you feel, in the morning, that your night's sleep was refreshing?; b and d): How often do you snore loudly during sleep? ▨ : asthmatics; ▤ : young wheezers; □ : other respondents.

Ordinal logistic regression adjusting for age, sex and snoring, showed that inclusion as a young wheezer was a significant independent predictor of unrefreshing nocturnal sleep ($p < 0.01$), and of having "too little sleep at night" ($p < 0.05$).

Discussion

This study shows a self-reported rate of frequent snoring of 15% in a sample of the British population over 40 yrs old. Our study also demonstrates that symptoms of nocturnal asthma are common among community-based asthmatics, that asthma is an independent predictor of unsatisfying nocturnal sleep, and that asthmatics contain a higher proportion of frequent snorers than non-asthmatics. The low response rate to our questionnaire increases the possibility that our 1,478 respondents might be a biased sample of the population. However, there are several factors against this response rate affecting our conclusions: 1) only a small proportion of the questionnaire was devoted to asthma, snoring and sleep, and it is thus unlikely that the questionnaire would appeal specifically to snorers or asthmatics; 2) our estimated point prevalence figures are consistent with those for snoring in other countries [2, 10], and for asthma in Britain and other countries [9, 11–14]; and 3) a low response rate would be unlikely to significantly affect the reported co-existence of symptoms, such as snoring and sleepiness, or asthma and snoring.

The prevalence of occasional (37%), and frequent (11%), snoring in our study is similar to that reported in Italy [2], and Sweden [10], and the frequency of frequent snoring is similar to that in a simultaneously performed British study [15] (16.9%). We found that respondents who snore on four or more nights per week

slept for a shorter time at night, had increased symptoms of daytime sleepiness and, in particular, had an increased tendency to falling asleep whilst driving or operating machinery. Frequent snoring was an independent predictor of accidental daytime sleep, and planned daytime napping, even when allowance was made for the age and sex of the respondents. Thus, we confirm [15–17] that snoring is specifically associated with excess daytime sleepiness. This association could be due to some of the snorers having occult SAHS or, perhaps more likely, that snoring disrupts sleep.

More than 80% of asthmatics and "young wheezers" had nocturnal awakening with asthma, and/or morning chest tightness at least occasionally, a finding which is consistent with other studies [4, 5, 18]. Two of these studies were based on asthmatics attending hospital-clinics [4, 18], who might be expected to have more severe asthma than average. The results of TURNER-WARWICK [5], from asthmatics attending general practice, were based on information returned from less than 5% of the general practitioners requested to provide information. Our results, however, confirm the high prevalence of nocturnal asthma symptoms previously reported in surveys of patients with asthma, and extend this information by our findings that sleep is more often unrefreshing in asthmatics, and that asthmatics have a higher prevalence of frequent snoring than non-asthmatics, despite being no heavier than the rest of the sample population.

Our finding of an increased prevalence of frequent snoring among asthmatics and "young wheezers" is original. BLOOM *et al.* [19] previously found a higher frequency of wheezing in snorers than non-snorers, but as the subjects in that study were 47 ± 22 yrs, and they observed snoring to be more frequent in smokers, most of their "wheezers" would probably have had chronic bronchitis and emphysema. NORTON and DUNN [20] found no

significant association between asthma and snoring, although their data show a trend for asthma to be commoner in occasional snorers (5%), than in non-snorers (2%). The increased frequency of snoring amongst asthmatics could result from increased nasal resistance, due to coexistent rhinitis or nasal polyps, in patients with asthma, which would result in a greater negative pressure being generated in the upper airway during inspiration, tending to narrow the upper airway and produce turbulent airflow. This increased prevalence of frequent snoring among asthmatics and young wheezers may be clinically important, as some asthmatics have been shown to bronchoconstrict in response to snoring [6, 7].

The fact that community-based asthmatics more frequently report unrefreshing nocturnal sleep also extends the previous observations of subjective difficulty in maintaining sleep, and early morning awakening, in asthmatics attending clinics [18]. However, unlike JANSON *et al.* [18], we did not find evidence of significantly increased subjective daytime sleepiness in our asthmatic group. Nocturnal bronchoconstriction, can lead to impaired sleep quality [21, 22], and many asthmatics have severe nocturnal bronchoconstriction virtually every night [23]. We have demonstrated reduced objective and subjective sleep quality in patients with nocturnal asthma, even when clinically stable [24]. Furthermore, oral slow-release bronchodilators used in the treatment of asthma, do not produce any objective improvement in the sleep quality of asthmatics [25], and may actually further disrupt sleep quality in these patients [26]. One previous questionnaire study [27] found that there was an increased frequency of nightmares, but no other difference in sleep symptoms in asthmatics. However, that study does not present data as to whether asthmatics felt that sleep was refreshing, or whether they had adequate sleep durations.

We conclude that nocturnal awakening and morning chest tightness, typical symptoms of nocturnal asthma, are very common in asthmatics in the community. Snoring is more common in asthmatics than non-asthmatics, and this difference cannot be explained by a difference in body mass index between the two groups.

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