Sex differences in the use of asthma drugs: cross sectional study

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Abstract

Objectives To assess the use of asthma drugs by men and women with asthma and to identify sex specific predictors for the use of oral steroids.
Design Cross sectional study.
Setting Six general practices in East Anglia.
Subjects 103 men and 134 women aged 20-54 with asthma.
Main outcome measures Self reported use of β agonists, inhaled steroids, and oral steroids.
Results No sex difference was found in use of β agonists or inhaled steroids. However a strong association existed between sex and oral steroid use. 40 (30%) women reported using oral steroids compared with nine (9%) men. Women were more than five times (odds ratio = 5.5, 95% confidence interval 2.2 to 13.7) more likely to report use of oral steroids than men after asthma symptoms, age, visits to the general practitioner in previous six months, and time since diagnosis of asthma were controlled for. Women who had visited the general practitioner for asthma one or more times in the previous six months were four times (3.9, 1.6 to 9.5) as likely to report use of oral steroids. In addition, more frequent visits to the general practitioner for asthma were related in a dose-response manner to a greater likelihood of using oral steroids among women after asthma symptoms, age, and time since diagnosis were controlled for. This relation was not observed among men.
Conclusion Women used oral steroids more than men. The more frequent consultations with a doctor by women may result in more requests for oral steroids or doctors may preferentially prescribe oral steroids to women.

Introduction

Women have been shown to use both prescription and non-prescription drugs more frequently than men.[1–4] Murdoch assessed the prescribing habits in an urban general practice and found that the percentage of women receiving prescriptions, excluding oral contraception, was higher than that of men in all age groups.[5] Women are more likely to receive long term repeated prescriptions of diuretics,[5] hypnotics,[6] and tranquillisers.[5] However, prescribing rates for cardiovascular drugs are higher for men than women at all ages.[7]

The reasons for differences in use of prescribed drugs among men and women are not clear. Women may have more illnesses or more severe illnesses then men. On the other hand, women may request drugs more often than men or doctors may be biased in their prescribing habits.

An epidemic of asthma deaths in New Zealand in the 1970s spurred many pharmacoepidemiological studies of prescribing trends of asthma drugs.[8–11] These studies focused on use of prescribed asthma drugs and underlying severity of disease and used prescription databases as a means of identifying patients and confirming prescription purchases. Yet despite the continued concern about certain asthma drugs being associated with increased risk of morbidity and mortality,[12 13] coupled with the findings that women use drugs more than men, we know of no studies that have assessed the relation between sex and use of asthma drugs. The objectives of this study were to assess the relation between sex and use of asthma drugs among adults and to identify predictors of sex specific use of oral steroids.

Subjects and methods

We studied adults aged 20-54 with asthma from six general practices in East Anglia. The study was approved by the relevant local research ethics committees. Four practices were in West Norfolk and Wisbech Health Authority and two were in Suffolk Health Authority. The total population in these areas was about 400 000. The total list size of the six practices was 67 000; three practices had about 6000 patients and three about 16 000. One of the three larger practices included a rural location. Four of the practices had asthma health promotion clinics.

Sampling method and data collection

Adults who received a prescription for drugs used for treating asthma one year before the study were identified through prescription databases from each of the participating practices. The sample was stratified into three categories of severity corresponding to the prescribed drugs: bronchodilator alone (mild), steroids (moderate), and nebuliser treatment (severe). We included all patients receiving nebuliser treatment

(n = 18, 5%) and a random sample from the other two groups (total sample, n = 359). The proportion of the sample in the steroid (n = 204, 57%) and bronchodilator only (n = 137, 38%) groups was determined by the proportion of use of each type of drug within the practice.

Information on visits to the general practitioner for asthma was abstracted from medical records. Sociodemographic factors, smoking status, and morbidity data for the previous six months were obtained through a survey questionnaire posted to the 359 patients by their general practitioner in March 1992. The questions were based on a questionnaire used in a previous study.[14] All non-responders were sent two reminders; the second reminder included another copy of the questionnaire and a stamped addressed envelope.

We received 253 responses—a 70% response rate. For patients to be included in the study asthma had to be noted in their medical records or confirmed by the patient's general practitioner. Of the 253 respondents, 16 did not have confirmed asthma and were excluded. Of the 237 remaining subjects, 72 (30%) used bronchodilators only, 150 (63%) used steroids, and 15 (6%) used nebulisers.

Asthma drugs

Study participants' reported use of β-agonist, inhaled steroids, or oral steroids was operationalised as a dichotomous variable (yes *v* no). A review of pharmacy prescriptions showed that 212 of 237 subjects had received a prescription for asthma drugs during the six month study period. We compared the sociodemographic characteristics, state of health, and self reported drug use for patients who completed the questionnaire with and without pharmacy prescriptions. Subjects without a record of pharmacy prescriptions were more likely to report using fewer drugs than participants with a pharmacy record (bronchodilators alone or in combination with inhaled steroids compared with three or more asthma drugs). Thus, participants without pharmacy prescriptions during the study seemed to have less severe disease than those who received a prescription. We therefore decided to include subjects who were and were not prescribed an asthma drug during the study to make our data more representative of a general sample of adults with asthma.

Asthma symptoms

Subjects were asked about asthma symptoms in the past six months. An asthma symptom score was analysed as a continuous variable using the sum of ordinal responses to seven questions. These questions related to trouble with asthma, attacks of wheezing and breathlessness, waking at night because of asthma, interference with daily activities, trouble walking on level ground, trouble walking uphill, and trouble climbing stairs. The responses to each question were weighted on levels of severity such as none, a little bit, a moderate amount, or a lot. We found moderate correlation among the responses to these questions (mean correlation coefficient 0.55, SD = 0.12), and all were highly significant ($P < 0.01$ for the correlation coefficients for all pairs of questions). The asthma symptom score was used as a continuous variable with values ranging from 6.3-26.0 in this population (possible range 6.3-28), with lower values corresponding to fewer asthma symptoms.

Statistical analysis

All tests were two sided and P values ≤ 0.05 were considered significant. In the univariate analyses we used *t* tests for continuous variables and χ^2 analyses for categorical variables. Logistic regression analysis was used to estimate the odds ratio for the use of oral steroids by women compared with men and to determine predictors of oral steroid use among women. Asthma symptoms, age, recent visits to the general practitioner for asthma, time since initial diagnosis of asthma, and smoking status were assessed as potential effect modifiers and confounders of the relation between sex and use of drugs. Variables were included in the model if their parameter estimates were significant ($P \leq 0.05$), if they caused an important change in the parameter estimate of the study variable, or if they improved the precision of the estimate as assessed by a decrease in the standard error of the parameter estimate for sex. We used SAS software for the personal computer for the statistical analyses.

Results

Of the 237 adults with asthma who were eligible for this study, 134 (57%) were women. Table 1 shows the sociodemographic and health characteristics by sex. Women and men differed significantly for only one variable: women were more likely to report one or more visits to the general practitioner for asthma in the six months before completing the questionnaire. On average women had a higher asthma symptom score and were older than men. Nevertheless, women reported having asthma for a shorter time than men.

Table 2 summarises the use of β agonists, inhaled steroids, and oral steroids by men and women. Similar percentages of men and women reported taking β agonists, inhaled steroids, or both β agonist and inhaled steroids (some of whom took other asthma drugs). Reported use of oral steroid differed significantly in men and women. A significantly greater percentage of women reported use of oral steroids than men regardless of their use of other asthma drugs.

Logistic regression analysis was used to estimate the odds ratio of oral steroid use by women compared with men (table 3). Women were over five times (odds ratio 5.53, 95% confidence interval 2.22 to 13.71) more likely than men to report use of oral steroids after asthma symptoms, age, one or more visits to the general practitioner in the last six months for asthma, and time since diagnosis were controlled for. Smoking status was not significant in the model.

Table 1 Distribution of sociodemographic and health variables by sex

Variable	Women (n=134)	Men (n=103)	P value
Mean (SD) age	39.6 (10.2)	34.9 (9.6)	0.14
No (%) of current smokers	40 (30)	24 (23)	0.34
Mean (SD) years since diagnosis of asthma	15.6 (12.6)	17.4 (11.6)	0.29
Mean (SD) asthma symptom score	12.4 (4.8)	11.6 (4.2)	0.18
No (%) visiting general practitioner*	52 (39)	24 (23)	0.02

*One or more visits to a general practitioner for asthma in past six months.

Table 2 Numbers (percentages) of men and women using asthma drugs

	Additional drugs		
	β agonist	Inhaled steroid	Oral steroid
Women (n=134)			
Total*	115 (86)	89 (66)	40 (30)†
β agonist and	26 (19)‡	77 (57)	37 (28)†
Inhaled steroid and	—	—	34 (25)†
β agonist, inhaled steroid, and	—	—	31 (23)†
Men (n=103)			
Total*	95 (92)	65 (63)	9 (9)†
β agonist and	24 (23)‡	61 (59)	8 (8)†
Inhaled steroid and	—	—	7 (7)†
β agonist, inhaled steroid, and	—	—	7 (7)†

*The three treatments are not mutually exclusive; 106 (29%) subjects took miscellaneous asthma drugs such as theophylline.
†P<0.01 for comparison between men and women.
‡β agonist only.

Table 3 Logistic regression analysis of sex and use of oral steroids

Variable	Odds ratio	95% CI
Female *v* male	5.53	2.22 to 13.71
Age*	1.00	0.96 to 1.04
Asthma symptom score*	1.08	0.99 to 1.16
Visits to general practitioner†	2.76	1.29 to 5.92
Years since asthma diagnosis*	1.05	1.02 to 1.08

*Continuous variable. †One or more visits to general practitioner for asthma in past six months.

Table 4 Relation between number of visits to general practitioner for asthma and likelihood of using oral steroids among women

No of visits	Odds ratio*	95% CI
0	1.00	—
1	2.53	0.92 to 7.13
2	6.91	1.05 to 45.5
⩾3	9.05	2.05 to 40.00

*Adjusted for asthma symptoms, age, and years since asthma diagnosis

The more frequent use of oral steroids among women was further assessed by restricting the sample to women. Logistic regression analysis showed that the degree of asthma symptoms (1.05, 0.96 to 1.15) and age (1.02, 0.98 to 1.06) were not significant independent predictors of oral steroid use among women. However, one or more visits to the general practitioner for asthma in the previous six months (3.88, 1.58 to 9.51) and a longer time since diagnosis of asthma (1.05, 1.01 to 1.09) significantly predicted oral steroid use among women even when symptoms, age, and years since diagnosis were controlled for.

A dose-response effect was seen between the number of visits to the doctor for asthma in the previous six months and the likelihood of reporting oral steroid use (table 4). Compared with women who had not visited their general practitioner for asthma in the past six months women who had visited the general practitioner once were 2.5 times as likely to take oral steroids, women who had visited twice were almost seven times as likely, and women who had visited three or more times were nine times as likely to use oral steroids.

Younger age (0.86, 0.74 to 1.01) and a higher symptom score (1.18, 0.99 to 1.41) were the only predictors of oral steroid use among men, although they were not significant. No dose-response relation between an increased likelihood of use of oral steroids and number of visits to the general practitioner for asthma in the past six months was found among men.

Discussion

Our subjects were representative of the general population of asthmatic patients in the practices from which they were selected. We found no sex difference among patients who reported use of β agonists and inhaled steroids. However, there was a strong association between oral steriod use and sex, and it remained in multiple regression analyses when adjusting for asthma symptoms, age, years elapsed since diagnosis, and visits to the general practitioner for asthma in the past six months. Although women reported shorter time since diagnosis of their asthma than men and a similar symptom score, they were more than five times as likely to report oral steriod use as men when other key variables were controlled for.

When we restricted our sample to women regression analysis revealed that having visited a general practitioner for asthma in the prior six months was a strong predictor of use of oral steriods yet having a higher asthma symptom score was not. The greater use of oral steriods by women may therfore suggest a higher prevalence of severe asthma which has been controlled by the additional use of oral steriods, or more frequent consultations with doctors or requests for steriods, or both. Women have been found to have higher death rates from asthma than men (2.3 v 1.3 deaths per 100 000 population in 1991)[15] and higher rates of morbidity,[12] which are consistent with more severe asthma. However, higher rates of morbidity and mortality among women may also be confounded by higher incidence of asthma in adult women. Trends and patterns in asthma diagnosis and treatment were assessed in a Medicaid patient population for 1980-6.[16] Gerstman et al found that among subjects younger than 20 years the prevalence of asthma was higher for men than women, but among those 20 years and older the prevalence was higher in women than men. Similarly, McWhorter et al found that female sex was the strongest predictor of new cases of asthma among a population based sample aged 25-74; asthma was equally prevalent in men and women, but the incidence was higher in women.[17] These reports are consistent with our finding that women reported having asthma for fewer years than men of comparable age.

We found a dose-response relation between the number of visits to the doctor for asthma in the previous six months and the likelihood of reporting oral steroid. Therefore differential prescribing of oral steroids to women who make frequent visits is also a plausible explanation for the increased use among women. Other studies have found that women make more consultations for asthma each year than men,[18] which suggests our results are generalisable.

Consideration should be given to whether the asthma symptom score was a sensitive and accurate measure of asthma symptoms. In our sample the score had a 20 point range (possible range 6.3-28). This suggests that it was capable of measuring a wide range of asthma symptoms from mild to severe and that the differentiation in symptom level between men and women was real.

Key messages

- Women tend to take more prescription drugs than men
- In this study men and women reported similar use of β agonists and inhaled steroids for asthma but women used significantly more oral steroids
- Women who had visited their general practitioner for asthma in the past six months were four times more likely to take oral steroids than those who had not visited
- A dose-response relation was found between number of visits to the general practitioner and use of oral steroids
- Women may be making more requests for steroids or doctors may be preferentially prescribing them to women

Further studies on a larger sample should be conducted to confirm the association between female sex, frequent surgery visits, and use of oral steroids and the dose-response relation in women. Our sample of 237 adults with asthma, of whom 40 women and 9 men reported use of oral steroids, limited the extent of possible analyses. A longitudinal study of initiation and use of oral steroids and how they differentially affect symptoms of men and women as well as of studies which have data on lung function would be useful to clarify reasons for differential use of oral steroids between men and women.

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Contributors: MS, NS, and RW designed and directed the study, SH and RW accessed the general practices, collected data, and reviewed the manuscript. MS, MDA, and DS formulated the idea for the manuscript. MDA and DS analysed the data. MDA and MS wrote the manuscript and are the study guarantors.

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A memorable patient

A very rare bleeding disorder

As a haematologist, I am often asked to evaluate patients for a possible bleeding disorder. A common story is that the patient has begun to notice bruising for which no antecedent cause can be identified. Many of the patients are young women who often present in early summer when they are more concerned about cosmetic disfigurement than a serious blood disorder. Such a patient came to me a few years ago. A secretary in her mid 20s, she had noticed the appearance of spontaneous bruises on her limbs, but none on her face or torso. A careful history and physical examination yielded no clue, and all screening tests for a possible bleeding disorder were returned with normal values.

Fortunately, the textbook provided me with a diagnosis. Purpura simplex, also known as "Devil's Pinches," is a curious ill defined disorder affecting young women. No underlying cause can be identified, and it is said that the Devil is attracted to these subjects, and expresses his affection by pinching them during his nocturnal forays. Recent studies have suggested that some patients have abnormal platelet function, but the disorder still remains poorly understood. I went through the all too familiar routine, concluding with my masterly diagnosis. This was cheerfully accepted by the patient, and rather reluctantly by the referring physician who would have preferred to have a more solid diagnosis. And that, so to speak, was that.

A few years later, I called a surgical colleague to refer him a patient. "Hi, Doctor Ramanan, how are you?" was the warm greeting from the receptionist. After assuring her that my health continued to be excellent, I warily inquired if I had ever met her before. "Don't you remember me?" Rather shamefully, I admitted that I did not, attributing the apparent lapse in my memory to the advanced age of 40. "I am the one who came with all the bruising." "And what happened?" I cautiously inquired. You are reluctant to probe too deeply into your diagnostic failures. "They've all gone," was the response. I must have uttered some curious sound because she went on, "You won't believe this, Doctor Ramanan. When I got my glasses they all went away." "Got what?" I responded. "You won't believe this," she repeated, "but I was as blind as a bat, bumping into everything because I couldn't see where I was going. Once I got my glasses, no more bruises."

"Curiouser and curiouser," as Alice said. I had seen my first (and only) patient with Myopia Haemorrhagica.

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