



Original Article

Factors Related With the Higher Percentage of Hospitalizations Due to Asthma Amongst Women: The FRIAM Study[☆]

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ABSTRACT

Introduction: The reason why there is a higher hospitalization rate due to asthma exacerbations amongst women is unclear. The objective of this study is to explore the possible causes that may explain this fact. **Methods:** A multi-center, prospective study including asthma patients hospitalized in the pulmonary medicine departments during a 2-year period.

By means of a questionnaire, the following data were collected: demographic characteristics and treatment compliance, anxiety-depression, hyperventilation and asthma control, both prior to and during the hospitalization.

Results: 183 patients were included, 115 (62.84%) of whom were women. The women were older ($52.4 \pm 18.3 / 43.4 \pm 18.7$; $P = .02$), were more frequently prescribed inhaled corticosteroids (63.2%/47.1%; $P = .03$) and had a higher rate of hyperventilation syndrome (57.3/35.9; $P = .02$) and a longer mean hospital stay ($7.3 \pm 3.4 / 5.9 \pm 3.6$; $P = .02$). The percentage of smokers among the women was lower (21.2%/38.8%; $P = .01$) and the FEV₁ was lower at admittance ($58.2 \pm 15.9\% / 67.5 \pm 17.4\%$; $P = .03$).

In the 40–60-year-old age range, an association was demonstrated between being female and the 'previous hospitalizations' variable (OR, 16.1; 95% CI, 1.6–156.7); sex and obesity were also independently associated (OR, 4.8; 95% CI, 1.06–22).

Conclusions: In this cohort, the rate of hospitalization for asthma was higher in women than in men. Being a woman between the ages of 40 and 60 is associated with previous hospitalizations and is a risk factor for asthma-related hospitalization. This situation could partially be explained by the hormonal changes during menopause, where polyposis and obesity are independent risk factors.

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Factores relacionados con el mayor porcentaje de ingresos por asma en mujeres. Estudio FRIAM

RESUMEN

Introducción: Las mujeres ingresan por exacerbaciones de asma con mayor porcentaje que los varones, sin que se conozcan claramente los motivos. El objetivo del estudio es explorar las posibles causas que expliquen este hecho.

Pacientes y métodos: Estudio prospectivo multicéntrico en pacientes ingresados por asma durante 2 años en servicios de neumología.

Mediante cuestionario se recogieron: características demográficas, variables previas al ingreso y durante el mismo que incluían adherencia, ansiedad-depresión, hiperventilación, y control del asma.

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Resultados: Se recogieron datos de 183 ingresos: 115 mujeres (62,84%). Las mujeres eran de mayor edad ($52,4 \pm 18,3/43,4 \pm 18,7$; $p = 0,02$); había mayor porcentaje con prescripción de corticosteroides inhalados ($63,2/47,1\%$; $p = 0,03$) y síndrome de hiperventilación ($57,3/35,9\%$; $p = 0,02$), y una estancia media mayor ($7,3 \pm 3,4/5,9 \pm 3,6$; $p = 0,02$). El porcentaje de fumadoras era menor ($21,2/38,8\%$; $p = 0,01$), y el FEV₁ al ingreso era más bajo ($58,2\% \pm 15,9/67,5\% \pm 17,4$; $p = 0,03$).

En el rango de 40 a 60 años se demostró una asociación entre ser mujer y la variable ingresos previos. De forma independiente, también se asociaron el sexo y la obesidad, con un OR de 16,1 (IC 95%, 1,6–156,7) y de 4,8 (IC 95%, 1,06–22), respectivamente.

Conclusiones: El porcentaje de ingresos por asma fue mayor en mujeres. Ser mujer entre 40 y 60 años se asocia con ingresos previos y constituye un factor de riesgo para ingreso por asma, en el que la hipótesis hormonal durante el climaterio podría explicar parte de los hechos. La poliposis y la obesidad son factores de riesgo, independientemente del sexo.

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Introduction

Despite the advances made in asthma management, this disease is still the cause of significant morbidity and mortality in adults.

The prevalence of childhood asthma is greater in males than in females (2:1, male:female), but this becomes progressively inverted after the age of 15.^{1–4}

In children, the number of hospitalizations due to asthma among boys are double the number of hospitalizations in girls^{5–7} (2:1, under the age of 10), but the opposite is true among adults, when hospitalizations are more frequent among women.^{7–13}

In 33 269 hospitalizations due to asthma in 70 hospitals in the United States, Skobeloff et al.⁷ found that in the age group between 0 and 10, hospitalizations due to asthma was double in males than in females; conversely, three times more women were hospitalized between the ages of 20 and 50.

Similar data have been provided by other authors in different geographical areas and time-frames: in Denmark, in a longitudinal prospective study with a follow-up of 3540 people for 16 years, Prescott et al.⁸ saw that the women had a greater risk of hospitalization due to asthma than men, with an RR of 1.7. In England, Hyndman⁹ showed a progressive age-related increase in hospitalizations due to asthma in women. The same is true in Canada,¹⁰ although here the differences diminished among older patients. In a similar study, Trawick et al.¹¹ report that the risk for hospitalization due to asthma in women versus men was 2.8 in the age range from 25 to 34. In more recent studies, Woods et al.¹² and Lin et al.¹³ both reported that women between 18 and 45 were hospitalized 3.7 times more than men, and that the difference in hospitalizations due to asthma in women and men varied by age intervals, finding a maximum rate of 2.41 in the age range between 40 and 54.

In the autonomous community of Madrid, according to the data of the hospital morbidity survey and the CMBD database (*Conjunto Mínimo Básico de Datos*),¹⁴ the age-adjusted rates of hospitalization due to asthma by age were 76/100 000 inhabitants for women and 58/100 000 inhabitants for men. This differential data has held true since 1995.

Despite the differences in methodology and the quality of the studies, it seems to have been demonstrated that after a certain age there is a greater number of hospitalizations due to asthma in women, which is continuous although variable in the age range intervals.

The reasons for this predominance of women in hospitalizations due to asthma are not understood. Trawick et al.¹¹ investigated the differences according to sex of those hospitalized with asthma, and they observed that women had an age 3.5 times higher than the men, but that there were no other differences in other variables, except that the males had a higher PCO₂ upon admittance, which suggests a greater severity of the obstruction.

In the study by Woods,¹² the women were also older and had more anxiety-depression, but there were no differences in

obesity, ethnicity, smoking, gastroesophageal reflux, hypertension, diabetes, pneumonia or respiratory failure.

It seems reasonable to think that that one of the causes for more hospitalizations due to asthma is the severity of the crisis, although none of the studies have shown such data. Curiously enough, some published data are even contrary to this assumption.¹¹

There are several theories that try to explain why women are hospitalized more than men in spite of a similar prevalence: greater disease severity as a consequence of hormonal mechanisms,¹⁵ differences in airway size,¹² increased perception of obstruction in women,¹⁶ greater exposure and allergies to indoor allergens,^{16,17} or even less-than-optimal treatment due to the behavior of the patient and/or the physician^{18,19} or social inequalities.²⁰ Seasonal variations do not seem to be related.²¹

Most studies are retrospective,^{9,10,13} and therefore the design is not adequate for determining the causes of the higher percentage of hospitalizations due to asthma in women. Understanding the causes of the increased hospitalizations could lead to better management of asthma patients and a decrease in hospitalizations, which would be accompanied by a savings in health expenses.

The objective of this study is to explore the possible causes that explain the current predominance of women in hospitalizations due to asthma.

Materials and Methods

Study Design and Population

A multicenter, prospective study with a selection of patients who had been hospitalized for asthma over the course of 2 consecutive years (March 2007–February 2009) in the pulmonology wards of six tertiary hospitals of the autonomous community of Madrid. Inclusion criteria for participation were: hospitalization due to asthma crisis, being diagnosed with asthma according to the American Thoracic Society criteria,²² age between 14 and 80. Exclusion criteria were: asthma patients hospitalized for causes other than asthma crisis, lack of collaboration or impossibility to perform the tests and age either less than 14 or over 80. The study was approved by the ethics committee (CEIC) of the Hospital Universitario Puerta de Hierro Majadahonda, and all the participants signed the corresponding informed consent.

Procedure

In the patient data notebook designed for the study, the following data were systematically recorded: demographic characteristics, data prior to admittance (year of asthma diagnosis, work history, smoking, allergy studies [taking to be true a positive or documented reference to one or more allergens with skin-prick tests or *in vitro* reactivity for an aeroallergen]), comorbidities reported by the patient (rhinitis, psychiatric disease, gastroesophageal reflux,

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