

Is the Incidence of Near-Fatal Asthma Decreasing in Spain?

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OBJECTIVE: A number of studies have shown that both mortality and hospital admissions due to severe asthma have decreased in recent years in many parts of the world. However, the situation in Spain has not yet been analyzed. The aim of this study was to determine the incidence of very severe, near-fatal asthma in recent years in various Spanish hospitals.

PATIENTS AND METHODS: A retrospective review of hospital records from 6 hospitals in 5 Spanish autonomous communities was conducted for the period 1997 to 2004 to determine the annual number of patients who required orotracheal intubation and mechanical ventilation due to an asthma attack.

RESULTS: Of the 130 patients included in the study, 81 (62%) were women and 61 (47%) were aged between 51 and 75 years. The number of cases observed for the periods 2001-2002 and 2003-2004 (32 and 18, respectively) was significantly lower than that observed for the 1997-1998 and 1999-2000 periods (40 in both cases; $P=0.019$). A significant increase in the incidence was observed in autumn and winter ($n=81$ [62%]; $P=0.018$). Seventeen patients (13%) died and 8 (6%) developed serious sequelae.

CONCLUSIONS: Although our sample of 6 hospitals is not widely representative of the entire population of hospitals in Spain, our findings strongly suggest a decrease in the incidence of near-fatal asthma in Spain in recent years

¿Disminuye la incidencia de asma de riesgo vital en España?

OBJETIVO: Estudios recientes muestran un descenso de la mortalidad y del número de los ingresos hospitalarios por asma grave en los últimos años en diferentes lugares del mundo. Se desconoce la situación en nuestro país. El objetivo del presente estudio ha sido determinar la frecuencia anual de las crisis de asma de riesgo vital muy grave en los últimos años en diversos centros hospitalarios españoles.

PACIENTES Y MÉTODOS: Se revisaron retrospectivamente los registros hospitalarios de los pacientes que precisaron intubación orotraqueal y ventilación mecánica por una crisis de asma en 6 hospitales pertenecientes a 5 comunidades autónomas. El estudio recogió el número anual de casos observado durante el período comprendido entre 1997 y 2004.

RESULTADOS: De los 130 pacientes incluidos, 81 (62%) eran mujeres y 61 (47%) tenían entre 51 y 75 años de edad. En los 2 últimos bienios (2001-2002 y 2003-2004) el número de pacientes recogidos (32 y 18, respectivamente) fue significativamente inferior al observado en los 2 primeros (1997-1998 y 1999-2000, con 40 cada bienio; $p = 0,019$). Se constató una incidencia significativamente mayor de casos ($n = 81$; 62%) durante las estaciones de otoño e invierno ($p = 0,018$). Fallecieron 17 pacientes (13%) y 8 (6%) presentaron secuelas graves.

CONCLUSIONES: Si bien 6 centros hospitalarios no son lo bastante representativos de la totalidad de los centros españoles, los resultados del presente estudio podrían orientar hacia un muy probable descenso en nuestro país de los casos de asma de riesgo vital en los últimos años.

Key words: Asthma. Near-fatal asthma. Orotracheal intubation. Mechanical ventilation. Asthma epidemiology.

Palabras clave: Asma. Asma de riesgo vital. Intubación orotraqueal. Ventilación mecánica. Epidemiología del asma.

Introduction

Although the prevalence of asthma increased considerably in the last decades of the 20th century,¹

recent data indicate that this trend is now stabilizing.² Accordingly, recent studies have demonstrated a clear decrease in both mortality and the rate of hospital admissions,^{1,3,4} a departure from older epidemics with high death rates. The trend is worldwide and has been observed in many distant parts of the northern and southern hemispheres.⁵⁻⁹ The reasons for the change have not yet been determined, although improved treatment and management strategies,^{5,9} stricter compliance with treatment guidelines,^{10,11} and better use of inhaled corticosteroids are all likely to have played

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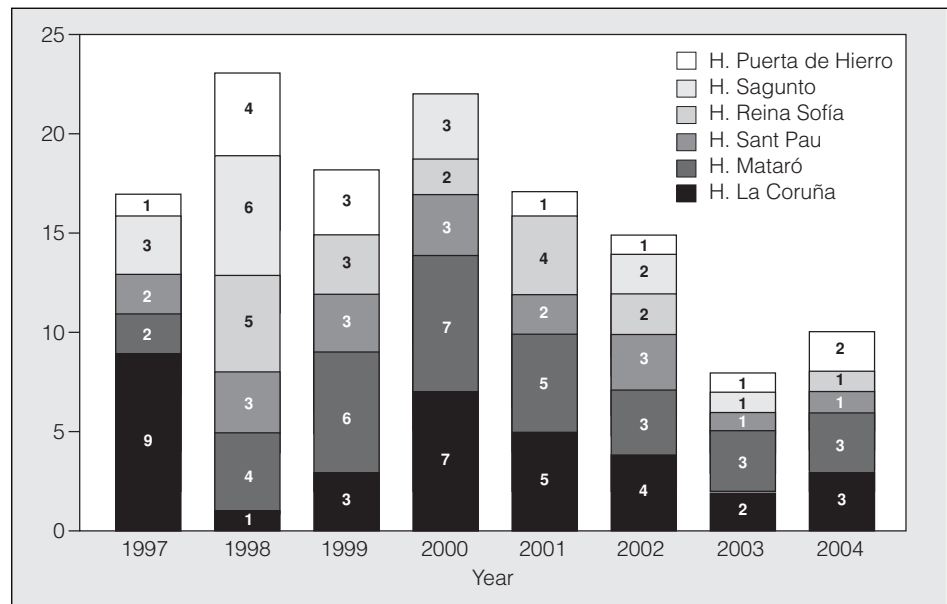


Figure 1. Number of patients who required orotracheal intubation due to very severe asthma, by year and hospital, for the period 1997-2004.

important roles. The only reliable epidemiological data available on asthma in Spain are related to prevalence¹³⁻¹⁵ and mortality.¹⁶ However, as the estimates were made in the 1990s, they do not reflect the above-mentioned downward trend.

As far as the current incidence of near-fatal asthma is concerned, there is very little information available in Spain or at the international level. To our knowledge, only one such study has been conducted and this also reported a downward trend in the number of near-fatal asthma cases.⁴ Nonetheless, the high number of cases (n=251) observed in the 33 hospitals that participated in a multicenter study of fatal and near-fatal rapid-onset asthma conducted by Plaza and colleagues¹⁷ in Spain over a 2-year-period suggested that incidence in Spain could be high. The study, however, was not designed to evaluate incidence, and its study period of just 2 years is too short to allow a retrospective estimate. The aim of the present study, however, was to discover what direction the trend of annual incidence of near-fatal asthma has been taking in Spain in recent years. To do this, we calculated the annual number of patients who required orotracheal intubation and mechanical ventilation due to an asthma attack in the last 8 years in 6 hospitals in different regions of Spain.

Patients and Methods

A retrospective, observational study was conducted to detect possible changes in the annual incidence of near-fatal asthma in recent years in different hospitals in Spain. We reviewed the hospital records of patients who required orotracheal intubation and mechanical ventilation due to a very severe asthma attack in 6 hospitals (4 tertiary care hospitals and 2 secondary care hospitals) from 1997 through 2004. The hospitals—Hospital de la Santa Creu i Sant Pau in Barcelona; Hospital de Mataró near Barcelona; Hospital Reina Sofia in Córdoba; Hospital Puerta de Hierro in Madrid;

Hospital de Sagunto in Valencia; and Complejo Hospitalario Universitario Juan Canalejo in La Coruña—were located in 5 different Spanish autonomous communities and had all participated in the aforementioned study by Plaza and colleagues.⁷

The study enrolled male and female patients who were over 13 years old, had a previous diagnosis of asthma, and were admitted to the intensive care unit (ICU) of one of the participating hospitals with a severe asthma attack that required orotracheal intubation and mechanical ventilation. Data on the following variables were collected for all of the study participants: demographic data, length of hospital stay in days, season in which attack occurred, and complications and mortality during hospitalization.

Statistical Analysis

For the descriptive analysis of the study group, all the variables were classified into 1- and 2-year periods. Data were expressed as means (SD) or percentages. Where necessary, quantitative data were compared using 1-way analysis of variance and qualitative data were analyzed using the χ^2 test. Statistical significance was set at a value of *P* less than .05. Statistical analysis was performed with the software package SPSS, version 9 (Chicago, Illinois, USA).

Results

A total of 130 patients required orotracheal intubation due to a very severe asthma attack. The annual incidence of intubation over the course of the study period showed a gradual downward trend, as can be seen in Figure. Incidence rates, percentages, and mean values for the different variables analyzed are shown in Table 1. Intubation was greater among women (*P*=.05) and 51-75-year-old patients (*P*=.001), and during the autumn and winter months (*P*=.018). The most serious complications reported were respiratory, infectious, and cardiac complications. The main sequelae were neurological and

neuromuscular (cerebral anoxia, myopathies, and neuropathies). Four of the patients (3%) were transferred from the hospital at the family's request.

When we analyzed the data by 2-year periods (Table 2), we saw a reduction in the number of orotracheal intubations in the 2 most recent periods (2001-2002 and 2003-2004) compared to the 2 earliest periods (1997-1998 and 1999-2000) ($P=.019$). No significant differences were observed for sex, age, season, and length of hospital or ICU stay.

TABLE 1
Characteristics of Patients Who Required Orotracheal Intubation Due to Very Severe Asthma from 1997 to 2004 (n=130)*

		P†
Sex		.005
Women	81 (62)	
Men	49 (38)	
Age, y		.001‡
14-25	15 (11.5)	
26-50	37 (28.5)	
51-75	61 (47)	
≥76	17 (13)	
Season		.018§
Winter	43 (33)	
Spring	30 (23)	
Summer	19 (15)	
Autumn	38 (29)	
Complications	33 (25)	
Mortality	17 (13)	
Sequelae	8 (6)	
Stay in ICU, d	15 (2)	
Stay in hospital, d	6 (6)	

*Data are shown as number of patients (percentage) or means (SD). ICU indicates intensive care unit.

† χ^2 statistical test.

‡Comparison between the 51-75 year age bracket and all other patients.

§Comparison of cases in autumn and winter with cases in spring and summer.

Discussion

The main findings of our study are that the number of orotracheal intubations due to very severe asthma in Spain has decreased since 2001, and that this downward trend was more pronounced in 2003 and 2004. The trend is consistent with findings from other countries,⁵⁻⁹ and it is the first time that a decline in asthma-related illness has been observed in Spain.

In contrast to findings from other decades, which showed a worrying increase in the worldwide prevalence and incidence of asthma,^{1,18,19} a number of recent epidemiological studies have pointed to a promising stabilization of both these indicators.^{20,21} Although the findings of a nationwide study conducted in Finland²² between 2000 and 2003 do not corroborate the decline, they do show that both asthma-related illness and mortality have decreased and that management of the disease has also improved. It is very likely that we are witnessing the first signs of a positive change in the epidemiological trends of asthma. This affirmation is, however, premature, and would need to be confirmed with additional epidemiological data from longer periods.

The decrease in asthma-related illness and mortality²⁵ may be the result of improved aspects of asthma care such as better therapeutic management of patients with asthma²³ and acute asthma²⁴ and, in some cases, the implementation of nationwide community action programs, such as in Finland.^{9,21} Our findings also indicate a possible decrease in asthma-related illness, as reflected by the reduction of the number of patients with very serious asthma attacks admitted to ICUs. By and large, our results are consistent with those of Han and colleagues,⁴ who observed a significant decrease in their hospital's monthly ICU admissions due to asthma from 3.1 in 1990 to 0.8 in 2001. Han and colleagues' findings also coincide with ours in that they observed a greater incidence of severe asthma among women patients and patients over 50 years old. In our study, this

TABLE 2
Characteristics of Patients Who Required Orotracheal Intubation Due to Very Severe Asthma in Each 2-Year Period (n=130)*

	1997-1998	1999-2000	2001-2002	2003-2004	P†
No. of patients	40 (31)	40 (31)	32 (25)	18 (14)	.019
Sex					NS
Women	25 (62.5)	24 (60)	21 (66)	11 (61)	
Men	15 (37.5)	16 (40)	11 (34)	7 (39)	
Age, y					NS
14-25	3 (7.5)	5 (12.5)	5 (15.6)	2 (11)	NS
26-50	12 (30)	7 (17.5)	12 (37.5)	6 (33)	
51-75	20 (50)	22 (55)	12 (37.5)	7 (39)	
≥76	5 (12.5)	6 (15)	3 (9.4)	3 (17)	
Season					NS
Winter	14 (35)	13 (32.5)	11 (34.4)	5 (28)	
Spring	8 (20)	10 (25)	6 (18.8)	6 (33)	
Summer	4 (10)	7 (17.5)	4 (12.5)	4 (22)	
Autumn	14 (35)	10 (25)	11 (34.4)	3 (17)	
Complications	9 (26)	10 (30)	11 (42)	3 (18)	NS
Mortality	7 (18)	6 (15)	1 (3)	3 (18)	NA
Stay in hospital, d	13 (7)	15 (19)	19 (20)	17 (16)	NS
Stay in ICU, d	5.7 (6)	4.9 (5)	7 (6.2)	7.2 (7)	NS

*Data are shown as number of patients (percentage) or means (SD). ICU indicates intensive care unit; NS, not significant; NA, not applicable.

† χ^2 test.

trend remained constant over the different 2-year periods analyzed, also consistent with earlier findings.²⁶ Incidence did not vary with mean duration of hospital stay in any of the periods analyzed for our or Han and colleagues' series. This could indicate that, although the number of very severe asthma cases is decreasing, the actual severity of the attacks is not. Nonetheless, in light of the findings of both studies, the decrease in the number of ICU admissions of asthma patients may be related to the improved management of asthma attacks by emergency services, both in hospital and nonhospital settings, as this, in theory, would reduce the subsequent need for intubation and mechanical ventilation.

More orotracheal intubations due to asthma were performed in the autumn and winter months, a trend which remained almost constant over the 4 periods analyzed, coinciding with the recently published seasonal patterns of asthma-related hospitalizations.²⁷⁻²⁹ However, it contrasts with the findings of a study by Plaza et al¹⁷ for 1997-1999, in which the authors detected a greater number of cases in the spring and autumn. This discrepancy could be explained by the fact that, given the design and objectives of their study, they very possibly did not record all the cases of near-fatal asthma in the participating hospitals. Mortality in the present study (13%) was slightly lower than that found by Plaza and colleagues (17%).¹⁷ Recent publications have reported a greater incidence of asthma-related mortality among women,³⁰ in patients in their late 40s, 50s, and early 60s, and during cold seasons (autumn and winter).²⁸ These findings are also consistent with ours.

Our data should be extrapolated to the Spanish asthma population with caution, however: a small number of hospitals participated and our sample is not statistically representative of the whole country. This does not, however, invalidate our main finding: that the number of near-fatal asthma attacks requiring orotracheal intubation in a sample of 130 patients in 6 hospitals located in 5 different autonomous communities in Spain decreased significantly over the study period. Our results could lay the groundwork for a more in-depth prospective study that might confirm our observation.

The decrease in the incidence of orotracheal intubation due to very severe asthma in the last 8 years in the 6 hospitals that participated in the study points to a highly likely recent decrease in the number of near-fatal asthma cases in Spain.

REFERENCES

- Mannino DM, Homa DM, Akinbami LJ, Moorman JE, Gwynn C, Redd SC. Surveillance for asthma—United States, 1980-1999. *MMWR Morb Mortal Wkly Rep.* 2002;51 Suppl 1:1-13.
- Lawson JA, Senthilselvan A. Asthma epidemiology: has the crisis passed? *Curr Opin Pulm Med.* 2005;11:79-84.
- Sly RM. Decreases in asthma mortality in the United States. *Ann Allergy Asthma Immunol.* 2000;85:121-7.
- Han P, Cole RP. Evolving differences in the presentation of severe asthma requiring intensive care unit admission. *Respiration.* 2004;71:458-62.
- Neffen H, Baena-Cagnani C, Malka S, Sole D, Sepúlveda R, Caraballo L, et al. Asthma mortality in Latin America. *J Investig Allergol Clin Immunol.* 1997;7:249-53.
- Kuo LC, Shau WY, Yang PC, Kuo SH. Trends in asthma mortality in Taiwan, 1981-2000. *J Formos Med Assoc.* 2003;102:534-8.
- Baluga JC, Sueta A, Ceni M. Asthma mortality in Uruguay, 1984-1998. *Ann Allergy Asthma Immunol.* 2001;87:91-5.
- Zar HJ, Stickells D, Toerien A, Wilson D, Klein M, Bateman ED, et al. Changes in fatal and near-fatal asthma in an urban area of South Africa from 1980-1997. *Eur Respir J.* 2001;18:33-7.
- Haahtela T, Klaukka T, Koskela K, Erhola M, Laitinen LA, on the behalf of the Working Group of the Asthma Programme in Finland 1994-2004. Asthma programme in Finland: a community problem needs community solutions. *Thorax.* 2001;56:806-14.
- Plaza V, Álvarez FJ, Casan P, Cobos N, López Viña A, Llauger MA, et al, en calidad de Comité Ejecutivo de la GEMA y en representación del grupo de redactores. Guía Española para el Manejo del Asma (GEMA). *Arch Bronconeumol.* 2003;39 Supl 5:1-42.
- Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention NHLBI/WHO Workshop Report. 2002. Available from: <http://www.ginasthma.com>
- Suissa S, Ernst P. Inhaled corticosteroids: impact on asthma morbidity and mortality. *J Allergy Clin Immunol.* 2001;107:937-44.
- Grupo Español del Estudio Europeo del Asma. Estudio Europeo del Asma. Prevalencia de hiperreactividad bronquial y asma en adultos jóvenes de cinco áreas españolas. *Med Clin (Barc).* 1996;106:761-7.
- Worldwide variations in the prevalence of asthma symptoms: the international study of asthma and allergies in childhood (ISAAC). *Eur Respir J.* 1998;12:315-35.
- Julià Serdà G, Cabrera Navarro P, Acosta Fernández O, Martín Pérez P, Batista Martín J, Álamo Santana F, et al. High prevalence of asthma symptoms in the Canary Islands: climatic influence? *J Asthma.* 2005;42:507-11.
- Soler M, Chatenaud L, Nefri E, la Vecchia C. Trends in asthma mortality in Italy and Spain, 1980-1996. *Eur J Epidemiol.* 2001;17:545-9.
- Plaza V, Serrano J, Picado C, Sanchis J. Frequency and clinical characteristics of rapid-onset fatal and near-fatal asthma. *Eur Respir J.* 2002;19:1-7.
- Viegi GA, Annesi I, Matteelli G. Epidemiology of asthma. *Eur Respir Mon.* 2003;23:1-25.
- European Community Respiratory Health Survey. Variations in the prevalence of respiratory symptoms, self-reported asthma attacks, and use of asthma medication in the European Community Health Study (ECRHS). *Eur Resp J.* 1996;9:687-95.
- Sunderland RS, Fleming DM. Continuing decline in acute asthma episodes in the community. *Arch Dis Child.* 2004;89:282-5.
- von Hertzen L, Haahtela T. Signs of reversing trends in prevalence of asthma. *Allergy.* 2005;60:183-292.
- Latvala J, von Hertzen L, Lindholm H, Haahtela T. Trends in prevalence of asthma and allergy in Finnish young men: nationwide study, 1966-2003. *BMJ.* 2005;330:1186-7.
- Rabe KF, Vermeire PA, Soriano JB, Maier WC. Clinical management of asthma in 1999: the Asthma Insights and Reality in Europe (AIRE) study. *Eur Respir J.* 2000;16:802-7.
- Rodrigo GJ, Rodrigo C, Hall JB. Acute asthma in adults. A review. *Chest.* 2004;125:1081-102.
- Rodrigo GJ, Rodrigo C, Nannini LJ. Asma fatal o casi fatal: ¿entidad clínica o manejo inadecuado? *Arch Bronconeumol.* 2004;40:24-33.
- Chen Y, Stewart P, Johansen H, McRae L, Taylor G. Sex difference in hospitalization due to asthma in relation to age. *J Clin Epidemiol.* 2003;56:180-7.
- Crighton EJ, Mamdani MM, Upshur REG. A population based time series analysis of asthma hospitalisations in Ontario, Canada: 1988 to 2000. Available from: <http://www.biomedcentral.com/1472-6963/1/7>
- Fleming DM, Cross KW, Sunderland R, Ross AM. Comparison of the seasonal patterns of asthma identified in general practitioner episodes, hospital admissions, and deaths. *Thorax.* 2000;55:662-5.
- Silverman RA, Stevenson L, Hastings HM. Age-related seasonal patterns of emergency department visits for acute asthma in an urban environment. *Ann Emerg Med.* 2003;42:577-86.
- Ringbaek T, Seersholm N, Viskum K. Standardised mortality rates in females and males with COPD and asthma. *Eur Respir J.* 2005;25:891-5.