



Original Article

Incidence and Characteristics of Asthma Exacerbations in Barcelona (ASMAB II)

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ABSTRACT

Introduction: A study has been carried out on the incidence and clinical characteristics of asthma exacerbations (AE) seen in hospital accident and emergency departments (HA&ED) and domiciliary services (DS) in Barcelona.

Patients and methods: AEs were identified over a 56-day-period during the October and November 2003 and the patients seen in university hospitals were interviewed.

Results: A total of 262 AE were identified, 188 in hospital accident and emergency departments and 82 in domiciliary care, which was a mean of 4.6 AE/day, giving an incidence of 0.37 AE/10⁵ inhabitants. This incidence was no different from that obtained in the same months in 2002 ($P > 0.05$). The mean age (\pm standard deviation) of the 143 cases of AE seen in university hospitals was 41 \pm 17 years; 87/143 (60%) were women and 57/138 (41%) smokers. In 36/61 (59%) the AE started in the home; in 88/132 (61%) it began 24 hours before arriving at the hospital centre. In 78/123 cases (63%) slow onset of nasal cold was noted before the AE and a viral infection was suspected. Inhaled corticosteroids were administered to 45/112 patients (40%), and only one was also given oral corticosteroids 12 hours before admission. The AEs were mild in 38/75 cases (51%), moderate in 28/75 (37%), severe in 8/75 (11%) and almost fatal in one patient (1.3%). Around 10% (13/137) of patients (10%) were readmitted.

Conclusions: The daily incidence of AE is 0.37/10⁵ inhabitants. More than half of the exacerbations started after nasal cold and 11% of the AEs were severe.

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Incidencia y características de las agudizaciones asmáticas en Barcelona (ASMAB II)

RESUMEN

Introducción: Se ha estudiado la tasa de agudizaciones asmáticas (AA) atendidas en los servicios de urgencias hospitalarios (SUH) y domiciliarios (SEM), así como sus características clínicas.

Pacientes y métodos: Durante los meses de octubre y noviembre de 2003 se identificaron durante 56 días las AA y se entrevistó a los pacientes atendidos en los hospitales universitarios.

Resultados: Se identificaron 262 AA, 188 en los servicios de urgencias hospitalarios y 82 en los domiciliarios, es decir, una media de 4,6 AA/día, lo que significa una tasa de 0,37 AA/10⁵ habitantes, incidencia no diferente de la obtenida en los mismos meses de 2002 ($p > 0,05$). La edad media (\pm desviación estándar) de los 143 casos de AA atendidas en los hospitales universitarios era de 41 \pm 17 años; 87/143 (60%) eran mujeres y 57/138 (41%), fumadores. En 36/61 (59%) la AA se inició en el domicilio; en 88/132 (61%) comenzó 24 h antes de la llegada al centro hospitalario. En 78/123 casos (63%) se registró catarro nasal de instauración lenta antes de la AA y se sospechó una infección vírica. Recibían corticosteroides inhalados 45/112 pacientes (40%), y únicamente uno añadió corticosteroides orales en las 12h previas al ingreso. La AA era leve en 38/75 casos (51%), moderada en 28/75 (37%), grave en 8/75 (11%) y casi fatal en un paciente (1,3%). Fueron readmitidos 13/137 pacientes (10%).

Conclusiones: La incidencia diaria de AA es de 0,37/10⁵ habitantes. Más de la mitad de las agudizaciones se habían iniciado tras un catarro nasal. Un 11% de las AA eran graves.

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Palabras clave:

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Introduction

Despite the scientific advances and the effective pharmacologic treatment of asthma available nowadays, it is well known that most patients show poor control of their affection and frequently present with symptoms of the disease.¹ To a large extent, this is due to deficient compliance with medication.² A bad control of the disease, apart from resulting in poor quality of life for the patients, generates within the health care environment huge economic costs, mostly when the disease exacerbates, and especially when the patients have to be hospitalised.³ Furthermore, being asthma a potential deadly disease, suboptimal treatment and control may have dismal consequences, especially when exacerbation is acute.

A previous study (ASMAB I),⁴ started 2 years ago, showed that the rate of asthmatic exacerbations (AE) treated at hospital emergency departments (ED) and at the patients' homes by medical emergency services (MES) was 0.5/10⁵ inhabitants/day (one exacerbation/200,000 inhabitants/day); only including October and November 2002, the rate was of 0.3/10⁵ inhabitants/day.⁴ Similarly, patients admitted to emergency services were ratified to poorly comply with their treatment, and their exacerbation episodes qualified as acute in 16% and almost fatal in 3% of the cases. Comparatively, one of the few prospective studies over a large number of patients carried out in France,⁵ showed that 49% of the episodes were moderate, 9% acute, and 26% almost fatal, which are figures differing widely from the ones obtained in our environment.

The objective of the present study is to re-assess, after 2 years, AE rate treated daily by both ED and MES. The point is to check whether its figures are similar to those in the ASMAB I study or not. It has also been investigated, amongst other clinical characteristics studied again, the percentage of patients whose decompensation was either acute or almost fatal, and also the differences in treatment received at discharge depending on patients being later re-admitted or not, given that in ASMAB I readmitted patients had received less antibiotics and ipratropium bromide.⁴

Patients and methods

Study Design

This is a prospective study designed to identify all AE episodes in patients older than 14 years treated in 3 large third level university hospitals in Barcelona (Clinical Hospital, Hospital del Mar and Vall d'Hebron Hospital) and 2 large second level hospitals located in the area of Clinical Hospital (Hospital del Sagrat Cor and Hospital of Barcelona), during October and November 2003. AE treated at the patient's home by MES were simultaneously identified. The main aim was to assess daily incidence of AE in the population covered by the hospitals mentioned above for reference, and at the same time, describe clinical characteristics of patients treated in those 3 large tertiary university hospitals.

This study was approved by the ethical committee of the Vall d'Hebron Hospital.

Identification of Patients with Asthmatic Exacerbation

Episodes of AE patients older than 14 yrs daily treated in some of the services and emergencies described were identified over a period between 6 October and 30 November 2003, a total of 56 days. It was considered relapse only when a patient was re-admitted within 15 days from discharge; on the contrary, when re-admitted after those 15 days the case was entered as new episode. Incidence was assessed as a rate, according to the formula referred to in section "Statistical analysis". One of the authors weekly revised data collection sheets from emergency services presenting with some of the following diagnoses: bronchial asthma, bronchospasm, bronchial

hypersensitivity, asthmatic bronchitis, spastic bronchitis, sibilant, asthmatic status, asthmatic crisis, acute or severe asthmatic episode, and acute-on-chronic (exacerbation) episode. Asthma diagnosis was entered when the patient, besides an asthma diagnosis given at the emergency service, met the clinical criteria set by the Global Initiative for Asthma (GINA)⁶: case history with dyspnoea episodes, sibilant thoracic oppression, as well as variability of these symptoms; diagnosis was also favoured by a family history of asthma and atopy.

Patients with AE were treated at their homes by MES, and diagnosis was based on the service medical criterion. Episodes treated at the patients' homes and later referred to a hospital were computed as one single episode. Death certificates for asthma were also checked at the hospitals' death wards, as well as judicial autopsies performed during the time period indicated above.

Risk Population

According to the city of Barcelona census,⁷ there are 449,210 inhabitants in area covered by Vall d'Hebron Hospital, in the area of Hospital del Mar: 285,188, and covered by Clinical Hospital and the 2 second level hospitals: 625,604, that is, a total of 1,360,000 people. As those under 14 are 11.73% (115,942 children), the number of people older than 14 years are 1,245,060. The percentage of people with asthma in Barcelona's population determined by an earlier study amongst people between 20 and 44 years was 6.5%;⁸ therefore, extrapolating these data to those older than 14 years, the totality of people with asthma in the area under study was of 80,928 individuals.

Clinic and Pharmacological Characteristics of Exacerbations Treated at Tertiary Hospitals

Personal details of each patient were collected in an ad hoc sheet, with date and site where AE started,⁹ and whether onset was sudden, with dyspnoea symptoms appearing in less than 30 min.^{10,11} or acute, when symptoms appeared in less than 3 h. Possible causes were identified: if AE was preceded by an upper respiratory tract cold of slow onset, 1-2 days, viral aetiology was assumed; on the contrary, when rhinitis onset was rapid, i.e. few minutes or hours, with sneezes and conjunctivitis, an allergic aetiology was assumed; irritating products (aerosols, ammonia, smoke, vapour, etc.) family stress/psychological causes, exercises, drugs, and others. Patients were also inquired on symptoms and signs at AE onset: dyspnoea, cough, expectoration, wheezing, thoracic oppression, rhinorrhea, sneezes, nasal pruritus, ocular symptoms, and others. Patients were inquired on the base treatment they were undergoing and drugs received in the 12 h prior to admission to emergency service.¹¹ Acuteness degree of exacerbation was determined by GINA 2002 criteria,¹² which considers respiratory rate, gasometry, oxygen arterial saturation and respiratory flow peak; when different parameters were not consistent with each other, the episode was qualified by the parameter indicating higher acuteness. The episode was considered almost fatal when at least one of the following criteria was met: a) respiratory arrest; b) mechanical ventilation, or c) carbon dioxide arterial pressure higher than 50mmHg.¹⁰ The number of patients who were hospitalised was recorded, including those who had stayed over 24 h in the day hospital or had been admitted to the hospitalisation ward. Charlson comorbidity index was assessed for each degree of acuteness.¹³

Questionnaire After Discharge

The patients were contacted by telephone and invited to answer a questionnaire to evaluate their health after about 15 days from discharge from tertiary hospitals. Re-admissions occurring within the first 15 days were also recorded.

Statistical Analysis

Frequency rate was calculated by the following formula: Rate = no. of episodes / 105 inhabitants / no. of days. Results are described by mean, standard deviation and percentages. Comparisons between groups were done by Kruskal-Wallis test for quantitative variables. Incidence rate risk within 2 years was estimated by Poisson regression using as offset the persons-time Neperian logarithm. Statistical significance level was set at a bilateral 5% and the analysis was made using SAS version 9.1.3 (SAS Institute Inc., Cary, NC, USA). The SPSS version 11.0 statistical package for Windows was used to analyse the results.

Results

Asthmatic Exacerbation Rate Treated at Hospital and Home by Emergency Service

During the 56 days under study a total of AE 262 were identified, 143 at third level university hospital emergency departments and 45 at second level hospitals. MES treated 82 AE during said period, although 8 of those patients were referred to some of the hospitals mentioned above, thus AE figure treated by MES was recorded as 74. As a result, incidence rate was 0.37 AE/10⁵ inhabitants/day (fig. 1), of which 0.27/10⁵ were treated at ED and 0.1/10⁵ inhabitants/day by MES (27% of total AE). During this period a death by asthma was recorded in a 49-year-old patient, occurred before his admission to hospital.

Incidence rate during the same 56 days in 2002 had been of 0.3 AE/10⁵ inhabitants;⁴ consequently, there were no statistically significant differences between those 2 years (relative risk = 1.1963, confidence interval = 95%, 0.9977–1.4344; *p* > 0.05).

Characteristics of the 143 Patients Treated in Tertiary Hospitals

Of the 143 patients treated by hospital ED, 65 (45%) were treated at Vall d'Hebron Hospital, 49 (35%) at Clinical Hospital, and 29 (20%) at Hospital del Mar. 87 (60%) of these patients were women. Their mean age (\pm standard deviation) was 41 \pm 17 years, and 63% were younger than 45 years. 57/138 (41%) were smokers, 58/138 (41%) non-smokers, and 23/138 (17%) ex-smokers.

Of the 143 patients treated by ED, a total of 123 (86%) could be inquired, 73 (59%) in person and 50 (41%) on the phone.

Data From Exacerbation Onset

Site of exacerbation onset could be identified in 61 patients: 36 (59%) at their home, 8 (16%) on the street, 8 (13%) at their workplace, and 7 (11%) in other places. 39 patients could recall what they were doing at that moment; 6 of them pointed out that exacerbation started when they were sleeping (15%), 5 (13%) when walking, and 4 (10%) when they were cleaning up. The rest of the activities referred to by the patients at exacerbation onset were varied.

AE onset suddenness could be found out in 132, being sudden (< 30 min) in 4 patients (3%), acute (< 3 h) in 12 (8%) and in less than 24 h in 39 patients (27%); in 88 cases (61%) the episode started gradually taking over 24 h. The time elapsed between exacerbation symptoms onset and arrival at ED could be determined in 103 patients: less than 1 h in 4/103 patients (4%); from 1 to 4 h in 12 (12%); from 4 to 8 h in 16 (16%); from 8 to 24 h in 10 (10%), and over 24 h in 61 (59%).

With reference to recognising a factor eventually triggering AE (fig. 2), 78/123 (63%) patients mentioned slow onset nose cold prior to exacerbation, and 26/121 (21%) rapid onset rhinitis and sneezes, taking a few minutes or hours. 23/120 (19%) patients said the episode to have been triggered by psychological factors of family type, work

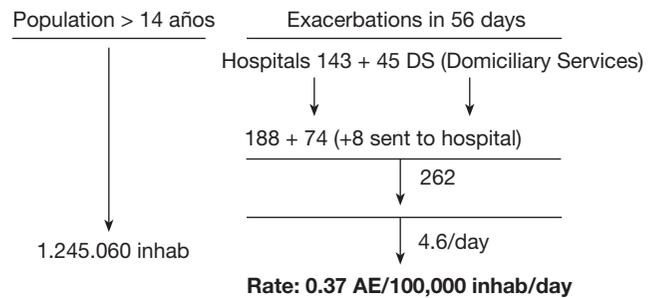


Figure 1. Rate of asthmatic exacerbations (AE) treated at hospital emergency departments (ED) and at patients' home by medical emergency services (MES).

type, etc, and an initial environmental factor of the irritating type such as sprays, ammonia, smoke, vapour, etc. was mentioned by 21/121 (17%) of the patients. 8/120 (7%) patients were exercising at onset. 9/120 (8%) patients said to have had some drug before AE onset. 2 patients: angiotensin-converting enzyme (ACE), 2 patients: anxiolytic drugs (temazepam and diazepam), 1: paroxetine, 1: acetylsalicylic acid, 1: steroid-free anti-inflammatory, 1: amlodipine, 1: risperidone; and 1: antiseptic. AE initial symptoms in the first 3 hours are shown in figure 3.

Treatment

The base treatment that the patients were undergoing before being treated at the emergency service, as well as that added up during the 12 hours prior to their arrival at such service, is shown in table 1.

Emergency Service Care

Diagnoses collected in the initial anamnesis sheet at the emergency service. Asthma in 120/137 patients (88%), rhinitis in 26/134 (19%), hives in 3/134 (2%), eczema in 8/135 (6%), conjunctivitis in 5/135 (4%), and one adverse effect for some medication in 8/134 (6%).

Initial data at admission. The acuteness of the crisis could be determined in 75 patients, with 4 determinations to establish acuteness: heart rate, respiratory rate, pulsioximetry, and respiratory flow peak. AE was considered mild in 38 (51%), moderate in 28 (37%), acute in 8 (11%), and almost fatal in 1 (1.3%). The number of determinations and the contribution of each one of them to qualify acuteness are shown in table 2, where it can be seen that a low heart rate is a good marker for mild AE; a high respiratory rate, up to 29 respirations/min, is frequent in moderate AE, and oxygen saturation < 90% is the best indicator for acute AE.

Temperature was checked in 123 patients, of whom 70/123 (57%) were below 36.5° C; 53 patients (43%) were above this figure, of whom 42 (34%) were over 37° C.

Medication administered at the emergency service during the first 2h. Shown in table 1. Oxygen therapy was administered in 37 patients (30%), adrenalin in 2 (2%) and theophylline in 2 (2%).

Outcome after admission to emergency service (fig. 4). 25/137 (18%) patients were admitted, of whom 23 were admitted to the hospitalisation ward and 2 to ICU. 19 patients were not discharged until after 24 hours, whom plus the 25 patients admitted to ward, make up 44/137 patients (32%) that can be considered admitted. Therefore, 93/137 (68%) were discharged before 24 hours. Charlson co-morbidity index scored 17 in patients considered admitted and 6 in those discharged before 24 hours elapsed.

Treatment was indicated when discharged from the emergency service. Data are shown in table 1.

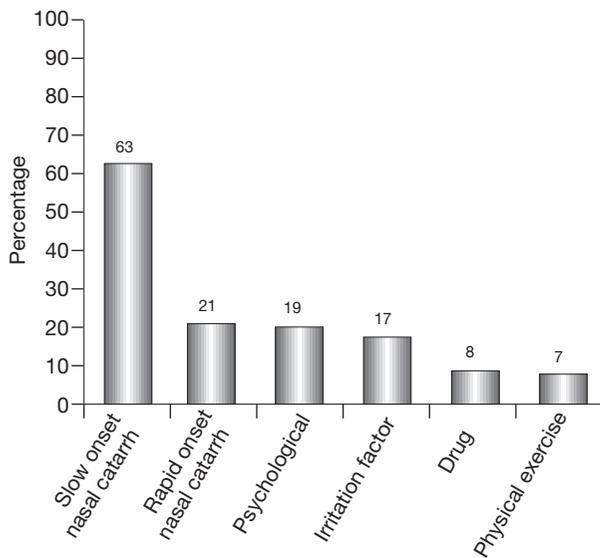


Figure 2. Patients acknowledging one or more triggering factors prior to exacerbation (n = 123).

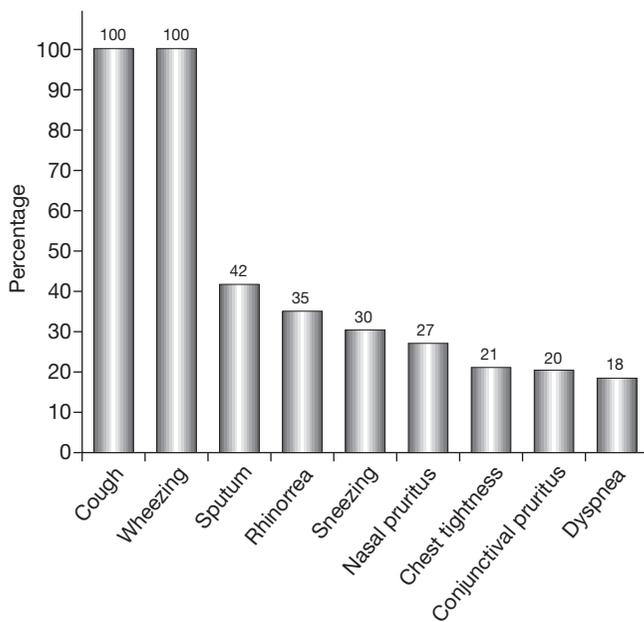


Figure 3. Symptoms in the first 3h of exacerbation (n = 113).

Discussion

The data presented in this study show an AE attention rate by ED and MES of 0.37 AE/10⁵ inhabitants/day. This figure is somewhat lower than the global figure in the study carried out 2 1/2 years earlier (2001-2002) using the same methodology, where the rate obtained between November and February was 0.50 AE/10⁵ inhabitants/day.⁴ However, the rate obtained over the same period of 56 days in October and November 2002 had been of 0.3 AE/10⁵ inhabitants/day, which is not a statistically significant difference ($p > 0.05$).

After these 2 studies carried out in our city, it is to be expected the frequentness of these 2 emergency services to be amongst the 5 annual averages and amongst the 3 and 3.7 AE/day in the months of

October and November per million inhabitants. Therefore, these figures could serve as a basis to deduce, in case of isolated increments, whether the increment recorded for a particular day is really significant, and in that case, to proceed searching for its aetiology. The cause may lie in an atmospheric phenomenon,¹⁴ an allergenic type discharge in the atmosphere¹⁵ or other aetiologies such as viral infections, especially rhinovirus,¹⁶ etc.

With reference to exacerbation onset, most episodes (59%) started at the patients' homes, only 3% were sudden and 8% acute, which are figures that keep correlation with the previous study.⁴ Bearing in mind the epidemic episodes due to soy downloads at the Barcelona docks in years 1981-1987,¹⁵ it was observed in the previous study (ASMAB I) that acute or sudden onsets were not related to a higher sensitisation to soy antigens. Furthermore, a higher percentage of women is maintained (60%) and a large number of patients said to have recently smoked, an alarming 41% in this case, still higher than 31% shown by the previous study.⁴

It is well known that most AE, also in adults, are induced by viral infection, especially rhinovirus.^{16,17} The finding that 63% of the patients mentioned to have had slow onset nasal cold may have correlation with this, and that 61% informed on arrival at emergency that their episode had started over 24 hours earlier. It also favours a viral trigger (or infectious in general) the fact that 43% of the patients presented with a temperature higher than 36.5° C, and that in 34% it was higher than 37° C. In contrast, only 21% informed to have had rapid onset rhinitis and sneezes that would lead to considering a trigger of an allergic type, which may relate to AE onset in less than 24 hours in 27% of the patients. We should, in any case, bear in mind that the present study was carried out in autumn, when viral infections are more frequent. A larger percentage of women, many of them housewives, possibly in contact with cleaning products,¹⁸ and the corroborated fact that 13% of AE started at work, could relate to an occupational type of trigger. Nine patients (8%) informed to have had a medication drug before AE onset started. Two of these drugs were steroid-free anti-inflammatories and 4 anxiolytics or anti-psychotics, which, apart from the inherent characteristics of the former, in the case of anti-psychotics, they are probably related to the psychological status of the patients before undergoing their crisis.

Regarding the treatment followed by the patients before their arrival at the emergency service, we have already mentioned the number of inhaled corticosteroids they said to have self-administered as base treatment: 40%, a figure higher than 31% of the previous study and that may originally lie in an improved control on the patients' part. In the EAGLE¹⁹ study, carried out in Spain and Latin America in patients admitted for asthma, it was observed that 61% use inhaled corticosteroids. Younger patients presenting with mild cases who are not admitted may use these products less than in the moderate or acute cases of those who are admitted. As seen in the previous study,⁴ we corroborated that the patients did not add up oral corticosteroids in the 12 h prior to their admission and that only one patient did; this may show deficient education of patients with relation to the treatment they should comply with in case of exacerbation.

With reference to attention at emergency service, it is worthy of note in the first place a good systemic exploration in recording temperature and heart and respiratory rates, as well as systematic recording of respiratory flow peak.

Likewise, medication administered reflected good compliance with the guidelines, given that in the first hours almost all the patients had received adrenergic β_2 stimulants, which is the treatment of choice; many of them (52%) together with ipratropium bromide that, as it is well known, is to be administered as coadjuvant, because it improves the effect of β_2 adrenergic.⁹ It is also important to note the large proportion of patients that received oral and/or IV corticosteroids. There was also a large number of

Table 1
Base medication, medication added during the 12 h prior to arrival at ED, medication administered during the first 2 h at the emergency service, and that recommended at discharge from this service

Medication	Base (n = 112)	Added during previous 12 h (n = 141)	First 2 h at emergency (n = 122)	At discharge (n = 137)	At discharge, for those not re-admitted (n = 124)	At discharge, for those re-admitted (n = 13)
β_2 rapid action	92 (82%)	80 (57%)	116 (95%)	132 (96)	121 (97)	11 (84)
β_2 prolonged action	40 (36%)	0	–	–	–	–
Inhaled corticosteroids	45 (40%)	0	78 (64%)	111 (81%)	90 (73%)	11 (84%)
Oral corticosteroids	0	1	20 (16%)	79 (58%)	71 (57%)	8 (61%)
IV corticosteroids	–	–	65 (53%)	–	–	–
Ipratropium bromide	30 (27%)	1	64 (52%)	53 (39%)	43 (35%)	10 (77%)
Antileukotrienes	7 (6%)	1	–	18 (13%)	16 (14%)	2 (15%)
Antibiotics	0	–	8 (16%)	50 (36%)	47 (38%)	3 (23%)
Antihistamines	6 (16%)	–	–	21 (15%)	19 (15%)	2 (15%)
Theophylline	0	1	2 (2%)	8 (6%)	7 (6%)	1 (8%)

* $p < 0.001$.

Table 2
Specific contribution of each one of the 4 parameters used to qualify acute degree of asthmatic exacerbations (AE), according to criteria of Global Initiative for Asthma (GINA¹²)

	Mild	Moderate	Acute
75 patients qualified by 4 determinations	38 (51%)	28 (73%)	8 (11%)
Determinations of 143 AE			
Heart rate (n = 132)	< 100 lat/min: 105 (79%)	100–120 lat/min: 25 (19%)	> 120 lat/min: 2 (1.5%)
Respiratory rate (n = 131)	< 18 resp./min: 17 (13%)	18–29 resp./min: 92 (70%)	> 30 resp./min: 15 (11%)
Oxygen saturation (n = 80)	> 95%: 42 (52%)	91–95%: 32 (40%)	< 90%: 6 (7.1%)
Expiratory peak flow	> 251 l/min: 50 (55%)	101–250 l/min: 39 (43%)	< 100 l/min: 2 (2%)

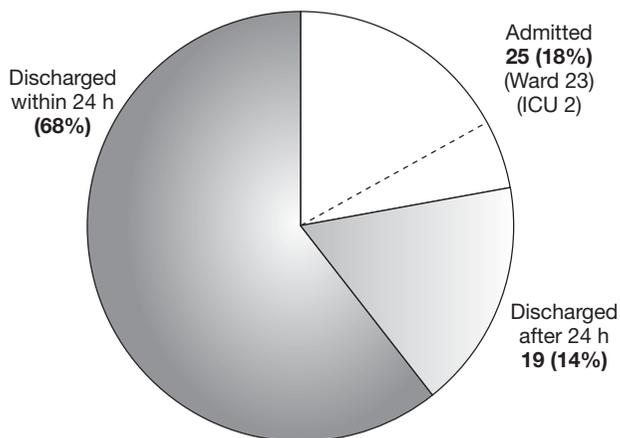


Figure 4. Patient outcome after admission at emergency service. ICU: intensive care unit.

patients (64%) treated with inhaled corticosteroids, which shows good knowledge and practice of the most recent recommendations;²⁰ in fact, inhaled corticosteroids have shown to have a beneficial effect on AE, especially when administered in multiple doses at initial phases in emergency attention.²⁰ On the contrary, the low rate of treatments with theophylline is also remarkable for a good therapeutic conduct at emergency, as it is well known that for exacerbation adding such drug to adrenergic β_2 does not lead to improvement of bronchodilatation.²¹

18% of the patients required hospitalisation after being treated at emergency. If to this percentage those who had to stay over 24 h in the emergency service area are added up—who were therefore considered as admitted—the total figure mounts to 32%, similar to that obtained by the ASMAB I study.⁴ In the present study the admission rate for asthma, including all the population treated for AE, that is, AE 262 in 56 days, was of 0.3 admissions for AE per 100,000 inhabitants. As it was the case in the previous study, those

patients who finally required hospital admission presented with more co-morbidity than those not admitted, which again leads us to deduce that some patients end up being admitted, apart from their asthmatic affection, for presenting with such co-morbidity.

As observed in table 1, treatment indicated at discharge, where a high prescription of adrenergic β_2 and inhaled corticosteroids is observed, adjusts to the guidelines, especially with reference to an indication of a short stretch of oral corticosteroids during 7–14 days.⁹

In the ASMAB I study we corroborated that the treatment indicated at discharge from emergency differed between patients that were later re-admitted and those who were not; in fact, the re-admitted had been prescribed proportionally less anticholinergics and less antibiotics, with a significant degree of difference: $p < 0.0001$ and $p < 0.001$, respectively.⁴ In the present study only differences in the prescription of ipratropium bromide are observed, which, as opposed to the ASMAB I study, it was prescribed for a higher percentage of patients amongst who were later re-admitted. In any case, we have to bear in mind that only 13 patients were re-admitted, so that such data should be interpreted with caution, as it also makes reference to a treatment indicated with no previous randomization.

It should be insisted on the importance of treating correctly, following the guidelines for asthma,^{22,23} those patients that have previously presented with a vital risk of AE, because it has been demonstrated that such compliance reduces mortality.²⁴

To conclude, in our city the AE rate treated daily by ED and MES was 0.37/10⁵ inhabitants. Most of them started on at their homes and exacerbation showed a gradual onset, that is, with time enough to act upon it and thus prevent their arrival at emergency services. In this study, with the limitation of having been carried out in autumn, a large proportion of AEs were preceded by slow onset cold, that is, probably viral. The patients, apart from inhaled adrenergic β_2 , in case of exacerbation are not educated to re-enforce their treatment with other rescue medication and/or orally administered corticosteroids. Once in ED, it was observed that 11% of exacerbations were acute and 1.3% of vital risk. Systemic exploration and treatment applied adjusted to guidelines.

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References

- 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.
- Global Initiative for Asthma (GINA). Available at: www.ginasthma.com. p. 85.
- Serra-Batlles J, Plaza V, Morejon E, Comella A, Bugues J. Cost of asthma according to the degree of severity. *Eur Respir J*. 1998;12:1322-6.
- Morell F, Genover T, Muñoz X, Garcia-Aymerich J, Ferrer J, Cruz MJ. Rate and characteristics of asthma exacerbations: the ASMAB I study. *Arch Bronconeumol*. 2008;44:303-11.
- Salmeron S, Liard R, Elkharrat D, Muir J, Neukirch F, Ellrodt A. Asthma severity and adequacy of management in accident and emergency departments in Fran a prospective study. *Lancet*. 2001;358:629-35.
- Global Initiative for Asthma (GINA). Available at: www.ginasthma.com. p. 68.
- Departament d'Estadística. Ajuntament de Barcelona. Available at: www.bcn.es/estadistica/.
- Grupo Español del Estudio Europeo del Asma. Estudio Europeo del Asma. Prevalencia de síntomas relacionados con el asma en cinco áreas españolas. *Med Clin (Barc)*. 1995;104:487-92.
- Rodrigo GJ, Rodrigo C, Hall JB. Acute asthma in adult. *Chest*. 2004;125:1081-102.
- Plaza V, Serrano J, Picado C, Sanchis J, High Risk Asthma Research Group. Frequency and clinical characteristics of rapid-onset fatal and near-fatal asthma. *Eur Respir J*. 2002;19:846-52.
- Barr RG, Woodruff PG, Clark S, Camargo CA. Sudden-onset asthma exacerbations: clinical features response to therapy, and 2-week follow-up. *Eur Respir J*. 2000;15:266-73.
- Global Initiative for Asthma (GINA), 2002. Available at: www.ginasthma.com. p. 134.
- Charlson M, Szatrowski TP, Peterson J, Gold J. Validation of a combined comorbidity index. *J Clin Epidemiol*. 1994;47:1245-51.
- Marks GB, Colquhoun JR, Girgis ST, Koski MH, Treloar AB, Hansen P, et al. Thunderstorm outflows preceding epidemics of asthma during spring and summer. *Thorax*. 2001;56:468-71.
- Antó JM, Sunyer J, Reed CE, Sabria J, Martínez F, Morell F, et al. Preventing asthma epidemics due to soybeans by dust-control measures. *N Engl J Med*. 1993;329:1760-3.
- Murray CS, Simpson A, Custovic A. Allergens, viruses, and asthma exacerbations. *Proc Am Thorac Soc*. 2004;1:99-104.
- Nicholson KG, Kent J, Ireland DC. Respiratory virus and exacerbations of asthma in adults. *BMJ*. 1993;307:982-6.
- Medina-Ramón M, Zock JP, Kogevinas M, Sunyer J, Basagaña X, Schwartz J, et al. Short-term respiratory effects of cleaning exposures in female domestic cleaners. *Eur Respir J*. 2006;27:1196-203.
- Bellido-Casado J, Plaza V, Rodrigo GJ, Neffen H, Bazús MT, Levy G, et al (en representación de las Áreas de Asma de ALAT y SEPAR). Agudización grave de asma y prescripción previa de corticosteroides inhalados en España y Latinoamérica: Proyecto EAGLE. 40.º Congreso Nacional de la Sociedad Española de Neumología y Cirugía Torácica (SEPAR). Barcelona, 1-4 de junio de 2007. *Arch Bronconeumol*. 2007;43 Especial Congreso: 2.
- Rodrigo GJ. Rapid effects of inhaled corticosteroids in acute asthma: an evidence-based evaluation. *Chest*. 2006;130:1301-11.
- Parameswaran K, Belda J, Rowe BH. Addition of intravenous aminophylline to beta2-agonists in adults with acute asthma. *Cochrane Database Syst Rev*. 2000;CD002742.
- Grupo Español para el Manejo del Asma (GEMA). Guía española para el manejo del asma. 2009. Available at: www.gemasma.com.
- Global Initiative for Asthma (GINA). Disponible en: www.ginasthma.com.
- Rodríguez-Trigo G, Plaza V, Picado C, Sanchis J. Management according to the Global Initiative for Asthma guidelines of patients with near-fatal asthma reduces morbidity and mortality. *Arch Bronconeumol*. 2008;44:192-6.