

## Prevalence, Characteristics, and Outcome of Asthmatic Patients With Type 2 Diseases in Hospitalized Patients With COVID-19 in Madrid, Spain

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Recent publications have reported that the prevalence of asthma in COVID-19 patients is equal to or lower than that of the general population. In a series from China, 11.4% of patients had drug allergy and 1.4% had urticaria, although no patients were reported to have asthma, allergic rhinitis, food allergy, or atopic dermatitis [1]. In another study of 548 patients, asthma was reported in 0.90% [2]. The prevalence of asthma in patients with COVID-19 has been reported to be 5.6% in Italy [3], 5.2% in Spain [4], 14% in the UK [5], and 17% in the USA [6]; these values are similar to those for the general population in these countries [7,8]. However, the clinical characteristics of asthmatic patients and their outcomes have been poorly studied. Mahdavinia et al [9] recently reported that pre-existing asthma is a predictor of longer intubation time in COVID-19 patients, especially in those younger than 65 years [9].

We aim to report the prevalence of asthma and type 2 diseases in a sample of hospitalized patients with COVID-19. We compared clinical and laboratory characteristics and outcomes with those of a population of COVID-19 patients without type 2 diseases at Fundación Jiménez Díaz University Hospital (FJDUH) in Madrid, Spain.

The FJDUH Institutional Ethics Board approved the study. We asked the Information Technology Department for a random sample of 200 consecutive patients aged over 18 years from the 567 patients hospitalized with suspected COVID-19 between March 1 and March 21, 2020. The final sample comprised 189 patients, whose infection was confirmed by polymerase chain reaction assay.

A retrospective review of electronic medical records was performed. The demographic and clinical characteristics of this cohort are detailed in Table S1. The data analyzed and the comparisons between asthmatic patients and nonasthmatic patients are provided in the Supplementary Material.

Of a total of 189 patients, 44 (23.28%) had a type 2 disease, with drug allergy (13.70%) being the most frequent, followed by allergic rhinitis (7.40%) and asthma (11 patients [5.80%]). Four patients had food allergy, 1 nasal polyps, 2 chronic urticaria, and 1 atopic dermatitis. We found 20 patients with aeroallergen sensitization, primarily to pollens (n=13) and dust mites (n=5).

From 11 asthmatic patients, 6 were diagnosed by a specialist (allergist or pulmonologist); the remaining 5 were diagnosed in primary care. Six had allergic asthma (2 sensitized to pollens and pet dander, 3 to pollen only, and 1 self-reported).

Six had intermittent asthma and were taking short-acting  $\beta_2$ -agonists as needed, and 5 had moderate asthma and were taking long-acting  $\beta_2$ -agonists combined with inhaled corticosteroids (LABA/ICS). Two patients were taking low-dose LABA/ICS (1 with prednisone 5 mg/d for rheumatoid arthritis) and the other 3 with medium-dose LABA/ICS (1 with montelukast 10 mg/d) [10]. Ten of the 11 patients had well-controlled asthma, and 1 had partially controlled asthma (medium-dose LABA/ICS and montelukast). Only 1 of the 5 patients with moderate asthma adhered well to treatment.

Two patients had an asthma exacerbation on admission for COVID-19. One died in the intensive care unit owing to complications of orotracheal intubation. The patient was a 70-year-old woman with moderate allergic asthma treated with medium-dose LABA/ICS and montelukast. Her adherence to inhaled treatment had been poor and she had other comorbidities (severe sleep apnea-hypopnea syndrome, obesity). During hospitalization, she was treated with LABA-ICS during hospitalization and received systemic corticosteroids. The second patient was a 42-year-old woman with moderate allergic asthma and obesity and type 2 diabetes who was also an active smoker. Adherence to inhaled therapy was poor. The patient received inhaled LABA-ICS during hospitalization but not systemic corticosteroids. Two asthmatics were admitted to the intensive care unit: one was described above, and the other was a nonobese 52-year-old woman with hypertension, hyperlipemia, diabetes, and well-controlled nonallergic moderate asthma. Adherence was good, and no asthma exacerbations were recorded during admission. The patient was eventually discharged. Two asthmatic patients died during admission; one was described above, and the other was a 71-year-old woman with hypertension. This patient was also an ex-smoker with nonallergic moderate asthma and poor adherence to therapy. She became infected by COVID-19 on the second day after abdominal surgery for incarcerated inguinal hernia, which was successful. All patients received

medication according to an evolving COVID-19 protocol (see Supplementary Material).

Comparison of the asthmatic and nonasthmatic group (Table) revealed that asthmatic patients were predominantly female ( $P=.056$ ; 95%CI, 0.07535-1.005). There were no significant differences in age, body mass index, smoking habit, or non-type 2 comorbidities. The association with allergic rhinitis was significantly stronger in asthmatic patients ( $P=.0004$ ; 95%CI, 3.627-29.912). No statistical differences were found between the groups for chest x-ray findings, symptoms of COVID-19, hospital stay (days), ICU admissions, or deaths. However, the nonasthmatic group had higher D-dimer on admission (4 times higher); the differences with the asthmatic group were not significant ( $P=.0846$ ). No significant differences were found between the groups for other laboratory findings (leukocytes, eosinophils, lymphocytes, C-reactive protein, D-dimer, ferritin) on admission or at discharge.

The prevalence of asthma in this study agrees with most published data in Europe and is similar to that of the general population in Spain [8,11].

Our other main objectives were to describe the relationship between type 2 diseases and COVID-19 hospitalization needs. Given that in our cohort of 189 patients, type 2 disease had the same prevalence as in the general population, this does not seem to be an aggravating factor for hospitalization due to COVID-19.

Asthma patients were predominantly female, as reported in other series of asthmatics with COVID-19 [8]. Asthma does not seem to be a risk factor for COVID-19, admission to the

ICU, or death. No significant differences between laboratory findings were found between the groups. Of note, only 2 of the asthmatic patients experienced asthma exacerbations on admission. One was admitted to the ICU and eventually died, although she had various comorbidities, as did the other asthmatic patient who died. This coincidence could explain the fatal outcome.

Our study was limited by the absence of lung function tests, which were not performed owing to restrictions recommended during COVID-19 [12] and the small group of asthmatics studied, although it is the first report detailing the characteristics of asthma in patients with COVID-19. Our results agree with asthma prevalence findings in other series, and the same can be said of findings for the prevalence of atopic diseases. These results should be confirmed in larger cohorts.

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The authors declare that no funding was received for this work.

#### Conflicts of Interest

JS reports having served as a consultant to Thermo Fisher, MEDA, Novartis, Sanofi, Leti, Faes Farma, Mundipharma, and GSK. He has also been paid lecture fees by Novartis, GSK, Stallergenes, Leti, and Faes Farma and has received grant support for research from Thermo Fisher, Sanofi, and ALK. VdP reports having served as a consultant to Astra Zeneca and GSK and having been paid lecture fees by Astra Zeneca and GSK. MJRN reports receiving a grant support for research from Astra Zeneca and GSK, serving as a consultant to Astra Zeneca and GSK, and having received payments for lectures by Astra Zeneca and GSK. The remaining authors declare that they have no conflicts of interest.

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Table. Characteristics of Asthmatic Patients Hospitalized With COVID-19

Asthma Group (N=11)	
Asthma diagnosis, No (%)	
By specialist (allergist or pulmonologist)	6 (54.54)
Primary care	5 (45.45)
Asthma severity, No (%)	
Intermittent	6 (54.55)
Mild	0 (0.00)
Moderate	5 (45.45)
Severe	0 (0.00)
Asthma treatment, No (%)	
SABA monotherapy	6 (54.55)
Inhaled corticosteroid monotherapy	0 (0.00)
Inhaled LABA/low-dose CS	2 (18.18)
Inhaled LABA/medium-dose CS	2 (18.18)
Inhaled LABA/medium-dose CS with Antileukotrienes	1 (9.09)
Inhaled LABA/high-dose CS	0 (0.00)
Biologics	0 (0.00)
Asthma control, No (%)	
Well controlled	10 (90.91)
Partially controlled	1 (9.09)
Poor controlled	0 (0.00)
Asthma characterization, No (%)	
Allergic	6 (54.54)
Nonallergic	5 (45.45)

Abbreviations: CS, corticosteroid; LABA, long-acting- $\beta_2$ -agonist; SABA, short-acting- $\beta_2$ -agonist

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