

Follow-up of children diagnosed with severe asthma before and during the COVID-19 pandemic

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ABSTRACT

During the COVID-19 pandemic, health care strategies were explored to ensure the follow-up of children with severe asthma.

This was a prospective, observational, and comparative study. Patients in the severe asthma program of a tertiary care children's hospital were included (n: 74). The extent of control, exacerbations, and hospitalizations during an in-person period (IPP) (March 2019–2020) and an online period (OP) (April 2020–2021) was assessed.

A total of 74 patients were enrolled in the IPP compared to 68 (92%) in the OP. During the IPP, 68% (46) of patients had exacerbations versus 46% (31) during the OP ($p = 0.003$). During the IPP, 135 total exacerbations were recorded compared to 79 during the OP ($p = 0.001$); this accounted for a 41% reduction. During the IPP, 47% (32) of patients had severe exacerbations versus 32% (22) during the OP ($p = 0.048$). A total of 91 severe exacerbations were recorded during the IPP compared to 49 during the OP ($p = 0.029$); the reduction was 46%. No differences were observed in terms of hospitalization (IPP: 10, OP: 6; $p = 0,9$). Telemedicine was effective for the follow-up of patients with severe asthma.

Keywords: asthma; patient severity; telemedicine; follow-up studies; exacerbation; pediatrics.

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INTRODUCTION

Severe asthma affects a small proportion of children with asthma (5%), but has a high morbidity.^{1,2} With the onset of the coronavirus disease 2019 (COVID-19) pandemic, Argentina established a preventive and mandatory social isolation policy by decree 297/2020 on March 20th, 2020 to prevent the SARS-CoV-2 dissemination. In-person healthcare consultations were called off.

To ensure the follow-up and treatment of patients in the Healthcare Program for Children with Severe Asthma (*Programa de Atención de Niños con Asma Grave*, PANAG) of Hospital Garrahan, telemedicine was adopted as a healthcare strategy.^{1,3}

Children with severe asthma require frequent controls. Such dynamics were affected by the pandemic. In-person consultations were suspended in 39% of healthcare centers, and no new patients were taken in 47%.³ In our center, the assessment of lung function and airway inflammation (FeNO test) was interrupted abruptly. The administration of treatments provided by the PANAG had to be restructured.³⁻⁵

Few studies have assessed the efficacy of teleconsultations for the follow-up of children with asthma.^{6,7} Although their usefulness has been established, the impact of teleconsultations on the number of exacerbations or hospitalizations due to asthma in this group of patients remains to be assessed.

The objective of this study was to compare the extent of control and the number of exacerbations and hospitalizations due to asthma in patients with severe asthma in a period with in-person care (immediately previous period, 2019) and in a follow-up period with telemedicine, during the pandemic. The same patients were monitored in both periods by the same healthcare providers.

POPULATION AND METHODS

This was a prospective, observational, and comparative study. All patients with severe asthma, as defined by the Global Initiative for Asthma (GINA) guidelines and followed by the PANAG, were included (n: 74).² The modality of care (in-person or online), the extent of asthma control using the Asthma Control Test (ACT), exacerbations, and hospitalizations were assessed in the same group of patients. The information was obtained during 2 periods: in-person period (IPP), from 03/01/2019 to 03/01/2020 (retrospective phase), and online

period (OP), from 04/01/2020 to 04/01/2021 (prospective phase).

During the IPP, patients were assessed twice monthly. In each consultation, the ACT, the number and severity of exacerbations, and hospitalizations were recorded.^{4,5} During the OP, patients were monitored by telemedicine. Every month, an electronic ACT was sent to them via WhatsApp. Within 48 hours, they were contacted by telephone and exacerbations, severity of exacerbations, and hospitalizations during the previous month were recorded. Exacerbations and their severity were defined as per the ATS/ERS guidelines.⁸

The ACT, exacerbations, their severity, and hospitalizations were compared between both periods.

During the OP, patients who experienced an exacerbation were referred to the hospital emergency room.

The study was approved by the Ethics Committee of Hospital Garrahan (Protocol 1258).

Statistical analysis

Mean and standard deviation (SD) or median, and interquartile range (IQR), Student's t test, and the Mann-Whitney U test were used as applicable. A *P* value < 0.05 was considered statistically significant. The Stata XIV software (Stata-Corp, College Station, TX) was used.

RESULTS

During the IPP, 74 patients were assessed; 92% of them (n: 68) were successfully contacted during the OP. Of the 6 patients lost-to-follow-up during the OP, 2 returned for follow-up with the PANAG after the pandemic and 4 discontinued it. The characteristics of patients are described in *Table 1*.

Table 2 shows data on clinical control, exacerbations, and hospitalizations.

During the IPP, 18% (n: 12) of patients were receiving treatment with omalizumab, while 12% (n: 8) did so during the OP. Two patients, although they were not followed online, continued treatment at home and then resumed control in the PANAG. After the family received online training, subcutaneous administration of the monoclonal antibody was performed at home in 50% of the cases, with remote tutoring on the day of administration. The rest of the patients attended the Department of Pulmonology for the drug injection.

TABLE 1. Characteristics of the population (n = 68)

Age (years)*	13 (10–15)
Male sex (% , n)	51% (35)
Budesonide or equivalent/long-acting bronchodilators*	800 µg (800–1600)
Eosinophils*	420 (220-690)
IgE*	568 (191-1020)
Rhinitis (%)	60%
Eczema (%)	35%
Lung function (in-person period)**	
FVC	111% (15)
FEV ₁	101% (16)
FEV ₁ /FVC	81% (10)
FMF _{25–75}	86% (41)

* Median (interquartile range [IQR]); ** mean (standard deviation [SD]).

n: number; IgE: immunoglobulin E; FVC: forced vital capacity; FEV₁: forced expiratory volume in the first second;

FEV₁/FVC: forced expiratory volume in 1 second and forced vital capacity ratio; FMF_{25–75}: forced mid expiratory flow between 25% and 75% of FVC.

TABLE 2. Course of patients during the in-person and the online periods (n = 68)

Assessment'	In-person period*	Online period**	P***
Consultations*/teleconsultations** (n)	374	642	< 0.0001
Consultations*/teleconsultations**/patient/year	5.5	9.4	< 0.0001
ACT (n)	212	642	< 0.0001
ACT/patient/year	3.1	9.4	< 0.0001
Uncontrolled asthma (% , n) (ACT < 20)	19% (40)	19% (120)	0.27
Total exacerbations	135	79	0.001
Exacerbations/patient/year	1.98	1.16	0.001
Patients with exacerbations (% , n)	68% (46)	46% (31)	0.003
Total severe exacerbations	91	49	0.029
Severe exacerbations/patient/year	1.33	0.72	0.029
Patients with severe exacerbations (% , n)	47% (32)	32% (22)	0.048
Hospitalizations	10	6	0.9
Patients who were hospitalized (% , n)	9% (6)	9% (6)	0.9

* In-person consultations; ** teleconsultations; *** Mann-Whitney U test;

n: number; ACT: asthma control test.

DISCUSSION

The restrictions imposed by the pandemic impacted the follow-up of patients with chronic diseases, such as asthma.⁹ During this period, the health care of children with severe asthma followed in the PANAG of Hospital Garrahan had to be rapidly restructured into an online modality to ensure patient care and monitoring.

Telemedicine became a widely accepted healthcare option during the pandemic. Health checkups were conducted by teleconsultation to allow for the recommended social distancing and reduce the need to travel during the lockdown.^{3,6,9}

New information and communication technologies (ICTs) have had a dramatic impact on health care. Different electronic media, such as e-mail, patient portals, and WhatsApp (the app

used in our study), were not originally designed for medical consultations, but are widely used in daily practice.⁷

In this study, we described the health care experience of a health center with a program for the follow-up of patients with severe asthma in place since 2000, but with no previous experience with online follow-up. The implementation of telemedicine made it possible to provide follow-up for almost all patients (92%) quickly and effectively.

The online ACT was effective to determine asthma control, with a very good response from patients and their families. Unfortunately, in our cohort, it was not possible to perform a spirometry at home because the technical resources were not available.

Asthma was controlled in most patients, with figures similar to the pre-pandemic period. Visits to the emergency department by children with asthma of all severity levels decreased dramatically during the COVID-19 pandemic, as well as hospitalizations.¹⁰ In agreement with published data, in this study, the number of exacerbations reduced by 41% compared to the previous year and severe exacerbations reduced by 46%, with no differences in the number of hospitalizations. Different explanations have been proposed to justify this phenomenon observed worldwide, such as a reduction in the dissemination of respiratory viral diseases, exposure to allergens, and environmental pollution. Likewise, a greater treatment adherence, with more parental supervision, and the priority given to asthma medication may justify the data observed.^{9,10} These situations may also have had a significant effect on asthma control in our patients, although they were not specifically assessed in this study.

Several published studies found an improvement in the rate of asthma control during the pandemic.¹¹⁻¹⁴ The Pediatric Asthma in Real Life (PeARL) survey and the World Allergy Organization (WAO) reported that 20% of patients had better asthma control, while 10% were negatively affected.³ These findings are different from our results. The number of patients with controlled asthma and hospitalizations remained stable during the pandemic, despite the significant reduction in exacerbations. These differences may be related to the study population, since only patients with severe asthma were included.^{3,11-14}

In our study, telemedicine could be implemented quickly and effectively, without affecting asthma control, with a very good response from patients and their families. The strategy of providing remote care and returning to in-person consultations as loss of asthma control was detected was an effective tool for the follow-up of patients with severe asthma.

The measures and form of care imposed by the pandemic allowed us to reconsider new alternatives for the control of asthma in our patients. Hybrid online and in-person strategies, which facilitate the follow-up of children without compromising the control of their disease, may be implemented in daily practice according to the results observed here. We currently continue with in-person visits and online consultations are available for patients without an adequate control. The administration of monoclonal antibodies at

home was introduced in this period and continues to the present day.¹⁵ ■

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