

ECIEN-2020 Study: the effect of COVID-19 on admissions for NON-COVID diseases

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Abstract

Introduction: The pandemic caused by SARS-CoV-2 coronavirus has had great effects on health systems worldwide, not only in relation to COVID-19 cases, but also affecting patients with other pathologies.

Material and methods: ECIEN-2020 is an observational study conducted in a tertiary referral hospital in Navarra, Spain to describe the effect of COVID-19 in pediatric admissions for NON-COVID diseases. Admissions during March-June 2020 (first wave of the COVID-19 pandemic in Spain) are described and compared with the same period in 2019. A sub-analysis was performed delving into epidemiology. Patient characteristics (age, sex, medical history), disease characteristics (symptoms, duration of symptoms, previous consultation in Primary Care Health Center) and admission characteristics (place and average stay) were analyzed.

Results: A 33% reduction in the number of admissions was observed, decreasing from 529 in 2019 to 353 in 2020, highlighting a 48% reduction in patients admitted for pulmonary diseases. There were no significant changes in age, average stay, admissions for other reasons, or Intensive Care Unit admissions. Percentage of patients admitted among those seen in the emergency department rose from 5.1% in 2019 to 10.9% in 2020, whereas the total number of consultations in the emergency department decreased a 68%.

Conclusions: The pandemic and the measures adopted due to SARS-CoV-2 have significantly decreased pediatric admissions for NON-COVID diseases, especially due to a reduction in hospitalization for respiratory diseases.

Introduction

On the 30th of January 2020 the World Health Organization (WHO) declared the disease caused by SARS-CoV-2 coronavirus (the COVID-19) a global pandemic.(1) Since then this novel coronavirus has spread rapidly and it has caused enormous repercussions on economic and health-systems worldwide (2–4). In Spain, due to the rapid increase of cases between February and March 2020, the Spanish Government declared a state of alarm on the 14th of March and established a situation of strict confinement, severe restrictions and lockdown throughout the country (5,6). This unprecedented situation, which lasted 99 days, was efficient in rapidly reducing the number of new cases and the community transmission rate (7), but it also carried important health, social and economic repercussions.

In Spain, the SARS-CoV-2 virus, responsible for COVID-19 disease (8,9), caused the saturation of the public health system, leading in certain autonomous communities to the collapse and saturation of hospitals and intensive care units, and causing extreme situations, due to a high number of patients and limitations in material and human resources (3,10). The efforts and changes made in order to meet the growing demand for COVID-19 cases, indirectly caused changes in the care and management of other NON-COVID pathologies. SARS-CoV-2 affects children, but multiple studies and previous publications have shown that it produces a more benign, milder and shortened condition (11–17). In many cases asymptomatic and with a greater clinical variability, being able to present the typical symptoms (fever, cough and respiratory distress) (18), but also presenting with a wide range of different affections, such as skin lesions, cardiac, neurological or digestive symptoms. (11,12,19) Even though pediatric cases are generally milder, severe cases as well as complications and mortality have also been described (19–22).

There are multiple studies published, analyzing cases and case series on the epidemiology and clinical evolution of COVID-19 in children, but this pandemic has also generated multiple changes in the care of pediatric patients with other diseases that deserve to be studied (10,19,23-25). Along with the exponential increased detected in the visits to the emergency department for symptoms suggestive of COVID-19, there was a decrease in the number of consultations for other reasons (10, 23) both in pediatric and adults ED.

The objective of this study is to analyze and describe the epidemiology of admissions for NO-COVID pathologies, in a pediatric hospital, and to compare the situation experienced during the first wave of the COVID-19 pandemic (March-June 2020) with the same period in year 2019.

Methods

This work has been performed within the ECIEN-2020 Study (from the Spanish "*Efecto de COVID-19 en Ingresos por Enfermedades NO-COVID*" or "*Effect of COVID-19 on Admissions for NON-COVID Diseases*"). This is an observational, cross-sectional analytical study, performed in Navarra, Spain, which describes and compares admissions during the COVID-19 pandemic, with admissions in the same period and same center in the previous year. The Autonomous Community of Navarre is located in northern Spain, and it has a population of over 660,000 habitants, of which 101,000 are children (0-15 years) (26). The study was performed in the Pediatric Service of the *Complejo Hospitalario de Navarra* (CHN Hospital), the tertiary reference public hospital for the Community. During the pandemic a specific hospitalization ward was opened for pediatric COVID-19 admissions at CHN Hospital, while the usual CHN hospitalization pediatric ward was kept open, for admissions of NON-COVID pathologies.

A retrospective search was performed on all pediatric patients (0-15 years) admitted to the pediatric service of the CHN Hospital during the study period. The number of visits to the pediatric emergency department, the total number of pediatric admissions in the CHN, and the number of admissions in the Observation Unit, the General ward, the surgical ward and Pediatric Intensive Care Unit (P-ICU) were analyzed. The mean stay (days) and mean age (years) of the admitted patients were analyzed. Data is presented divided in 4 monthly periods from March 12 (when Navarra entered in a situation of SARS-CoV2 community transmission) to June 12 (27). All patients hospitalized in the pediatric ward had a negative SARS-CoV2 PCR test prior to admission.

To better describe the characteristics of hospitalized patients, during the pandemic a more exhaustive sub-analysis was performed. The month of April 2020 was chosen, for this sub-analysis as it was the first complete month that Spain was under the state of alarm, with schools closed and compulsory strict

confinement (6) In this patients, we analyzed retrospectively data from the digitalized medical history, including epidemiological data, reason for consultation in the emergency department, reason for admission, if they had previously consulted their pediatrician at their local health care center, diagnosis, mean stay, admission to P-ICU, and patient characteristics (age, sex, personal history, previous illnesses and inclusion in our chronic children unit). All admissions were included in the ECIEN-2020 study (both NO-COVID and COVID-19 admissions).

Analyses were performed with the statistical program STATA.12. The analysis of the qualitative variables (sex, inclusion in the chronic circuit, stay in P-ICU, visit to the pediatrician at the Primary care center and diagnosis according to the pathology) was performed with Pearson's Chi2. Whereas the quantitative variables (age, days of admission, days in P-ICU and duration of symptoms before consulting to the Emergency Service), were analyzed with the T student's test. All statistical analyzes were performed with two tails and a p value of less than 0.05 was used as a point of statistical significance. The entire study has been performed according to the Declaration of Helsinki of 1975 (revision of October 2000), the local recommendation of the Spanish General Health Law on research and the ethical standards of the local Ethics Committee. The Ethics committee of Navarra Health department approved in May 2020 a study of the effects of Covid-19 on Navarra's pediatric patients. (*PI_2020/38: Estudio epidemiológico de las infecciones respiratorias por el nuevo Coronavirus (SARS-CoV-2) en población pediátrica*)

Results

SARS-CoV-2 caused more than 5.000 confirmed adult cases and 300 confirmed pediatric cases between February and June 2020 in Navarre, with 528 adult deceases(27). In adults the highest hospital admissions rate was around week 12th (last week of March), reaching up to 100 COVID-19 admissions per day (27,28). Admission rate in children was clearly inferior, (n:12 patients) showing 1 admission per each 100.000 children in Navarra, and a ratio of 1 admitted children per every180 adults (19). In the CHN pediatric service, around 40.000 consultations are attended every year in the Emergency Department (ED), and 2.000 children are admitted in the pediatric service. In 2019, 40.870 children were attended in the ED, 1.708 patients were admitted to the Observation Unit, or Short-Stay ED-Unit, 1.883 in the General Pediatric Hospitalization Ward and 190 in the P-ICU.

In the 4 month-period analyzed in ECIEN-2020 study (March- June), a total of 10.298 children were attended in the ED in 2019 compared to 3.239 in 2020, representing a reduction in ED consultations of 68%. In addition, the number of patients admitted in the Short-Stay ED-Unit decreased from 463 in 2019 to 113 in 2020, showing a 75% reduction. In terms of hospital admission, a total of 529 patients were admitted in the 2019 period while 353 patients were admitted in the same period in 2020, resulting in a 33.3% reduction in the number of total pediatric admissions in CHN. The number of admissions in the CHN-Hospital P-ICU dropped from 56 to 33 patients. The percentage of patients hospitalized among patients attended in the ED rose from 5.14% in 2019 to 10.9% in 2020 during the pandemic 4-month-period.

Analyzing data on a monthly basis, consultations attended in the ED between March 12th and April 12th dropped 70% in 2020. This trend remained stable within the subsequent months analyzed (table 1). Hospitalizations in the general pediatric ward also decreased from 112 to 75 admissions, representing a 33% reduction. This reduction remained similar in the ECIEN-Study time-period. A statistically significant decrease (p<0,001) was found regarding the total number of admissions in the March-June quarter in 2019 (529 admissions) compared to the same quarter in 2020 (353). Table 1 includes a monthly description of the admissions for NON-COVID diseases in the general pediatric ward, the pediatric surgery ward and the P-ICU, between 2019 and 2020.

A sub-analysis of hospital admissions during a 4 week-period (April 2019 vs. 2020) is displayed on table 2. No significant changes had been found among the patient's characteristics evaluated. Mean age was slightly lower in 2020 (4.1 vs 3.5 years), with similar rates regarding sex, previous diseases or inclusion in the Chronic-Patient Unit. No differences were neither found on the number of children who had consulted their Primary Health Care Center pediatrician prior to be attended in ED, nor regarding the percentage of children who required P-ICU admission (11.2% in 2019 vs 17.5% in 2020). In relation to admission data, no significant differences were observed in average stay (7.5 days in 2019 vs 5.2 days in 2020). In 2020 patients tend to take longer to consult in the ED after symptom's onset (3.8 days in 2019 vs 5.5 days in 2020), but no statistical significance was found. Regarding hospitalization cause, a clear reduction in pulmonary diseases was noted, showing a 48% decrease (from 63 in 2019 to 11 admissions for respiratory pathology in 2020, p<0.01). In 2019, pulmonary diseases (such as asthma exacerbation, respiratory infections and pneumonia) were the reason for hospital admission in more than half the hospitalized cases, but it represented less than one third of 2020 admissions. The percentage of admitted children with previous diseases and those included in the Chronic Children Unit, was also analyzed not finding significant changes (41.9% and 14.5% in 2019 respectively, vs 54.6% and 9% in 2020). When analyzing admissions for other diseases, no significant differences have been found, although an increase in digestive causes was detected (22.5% in 2020 versus 11.9% in 2019). No mortality was recorded during the analyzed periods in the pediatric department of CHN-Hospital.

Discussion

ECIEN-2020 shows the impact of COVID-19 and the state of alarm on hospital admissions among pediatric population in a Spanish region. During the first wave of the pandemic, a noticeable decrease has been observed in the total number of ED consultations (68% reduction), as well as in the total number of inpatients (33% reduction). Previous studies have been conducted, analyzing the reduction in the number of ED consultations, with results similar to our data (a 64% and 76% decrease was seen in two different Italian cities) (10), but to our knowledge this is the fist study to describe the influence of the COVID-19 pandemic on pediatric hospital admissions. The significant decline found in the number of ED consultations can be explained due to several reasons. On the one hand, patients' fear of contagion in hospitals; on the other hand a possible reduction in the number of infectious diseases as a result of SARS-CoV2 preventive measures (facial masks, hand washing, social distancing, schools closures...). The reduction seen in the number of consultation seen on the ED may ALSO be related to the fact that many consultations usually attended in the public pediatric ED imply mild clinical symptoms, non-urgent and hence not really subsidiary of hospital care. Out of the ED consultations, a 5.14% of patients were admitted to CHN in 2019, whereas this percentage doubled in 2020, probably because patients attended in the ED during the pandemic, presented diseases with a greater degree of severity. Regarding the decrease observed in the total number of admissions, the significant reduction in patients hospitalized for pulmonary diseases must be highlighted. This may be due to an indirect

decline in the transmission of other common respiratory infections (influenzae and other respiratory viruses) after the implementation of hygiene and social recommendations against SARS-CoV-2. Hygiene measures have proven to be effective in reducing pulmonary diseases in children (29); in fact, no reduction has been found regarding other causes of admissions less dependent on interpersonal contact. Whereas ED consultations and admissions declined, the number of P-ICU admissions remained stable (figure 1). It could be inferred that the reduction on emergency consultations and admissions was not secondarily associated with a worsening in the clinical evolution or prognosis of admitted patients, although a low statistical power due to the small sample size may also be considered.

Limitations and strengths: Certain limitations and strengths in ECIEN-2020 study should be taken into account. To our knowledge, this is the first study in describing the impact of this pandemic on hospital admissions in children. Navarra has been one of the most affected regions by COVID-19 in Spain (30,28), but thanks to a great effort in resources organization the CHN did not collapse and no pediatric patient needed to be transferred outside the community for hospitalization during the pandemic. Navarra also has a well-developed and centralized digital clinical history, allowing retrospective data revision from Care Health Centers, Emergency Departments and Hospitalization Areas. ECIEN-2020 has been conducted in the referral pediatric hospital in Navarra, where COVID-19 and NON COVID were admitted. As limitations of our study, an insufficient sample size could be considered as a reason for the lack of significant differences found regarding some of the analyzed parameters. However, a significant decrease in total admissions and admissions for pulmonary disease have been found despite this limitation. Also ECIEN-2020 did not collect information of the secondary or private hospitals in the community. The study has been performed comparing data collected during the pandemic year with the previous year (2019), which may lead to errors due to normal season variability.

In conclusion ECIEN-2020 describes how COVID-19 pandemic and the measures adopted during lockdown, caused an important decrease in pediatric ED-consultations and hospital admissions, in particular hospitalizations due to respiratory diseases in Spain. This reduction was not associated with worst illness evolution, longer hospital stays, higher mortality rates or higher P-ICU admissions. It is advisable to conduct further studies including comparisons with multiple seasons, bigger sample size, and multicentre- or meta-analysis-studies, to confirm these results and better understand these findings.

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Tables

Table 1. Healthcare delivered and total admissions registered in the Pediatric Service of CHN-Hospital, in Navarra, Spain. Monthly comparison of the COVID-19 first pandemic wave (March-Jun 2020) with the same time-period in 2019. Study ECIEN-2020.

	March		April		May		June	
	2019	2020	2019	2020	2019	2020	2019	2020
Emergency Department								
Visits (n)	2301	693	3446	162	3232	1255	1319	511
Admissions								
Short Stay Unit (n)	101	29	162	26	148	41	52	17
General Ward (n)	112	75	179	122	166	114	72	42
P-ICU (n)	8	5	16	12	20	8	12	8
Surgerical Ward (n)	26	10	26	22	40	10	17	20
Average stay (days)	7,47	7,04	6,69	7,28	8,37	7,67	7,49	6,57

P-ICU: Pediatric Intensive Care Unit

Table 2. Clinical and socio-demographic characteristics of pediatric admissions in CHN Hospital in Navarra, Spain, during a one-month period. Comparison of April-2020 (COVID-19 Pandemic and Spanish State of Alarm) with April-2019 (control period). Study ECIEN-2020

	April 2019	April 2020	P
CHN Pediatric Ward admissions (n)	118	40	<0,001
Patients characteristics			
Sex (% males)	70 (59,32 %)	25 (62,5%)	0,72
Age (years)	4,1 (4,4)	3,5 (3,7)	0,47
Personal history (% positives)	66 (56 %)	22 (54 %)	0,81
Chronic Patient-Unit (% included)	17 (14,5 %)	5 (12,5 %)	0,75
Diseases characteristics			
Previous consultation in PHCC (%)	61 (51,7 %)	20 (50 %)	0,85
Previous symptoms duration (days)	3,8 (5,2)	5,5 (8,2)	0,13
Pathology			
Pulmonary	63 (53,4 %)	11 (27,5 %)	0,005
Digestive	14 (11,9 %)	9 (22,5 %)	0,10
Neurological	14 (11,9 %)	6 (15 %)	0,61
Nephrological	12 (10,2 %)	4 (10 %)	0,98
Endocrinological	4 (3,4%)	1 (2,5 %)	0,78
Cardiological	1 (0,8%)	2 (5 %)	0,10
Hemato-oncological	9 (7,6 %)	5 (12,5 %)	0,35
Others	1 (0,8 %)	2 (5 %)	0,10
Admissions characteristics			
Average stay (days)	7,5 (20,0)	5,2 (5,6)	0,48
P-ICU			
Admission in P-ICU	13 (11,2 %)	7 (17,5 %)	0,31
Average stay (days)	0,4 (1,3)	0,5 (1,6)	0,73

Quantitative variables expressed as absolute number (n) and percentage (%) and qualitative variables expressed as mean (M) and Standard Deviation (ST).

PHCC: Primary Health Care Centre; P-ICU: Pediatric - Intensive Care Unit.

Figures

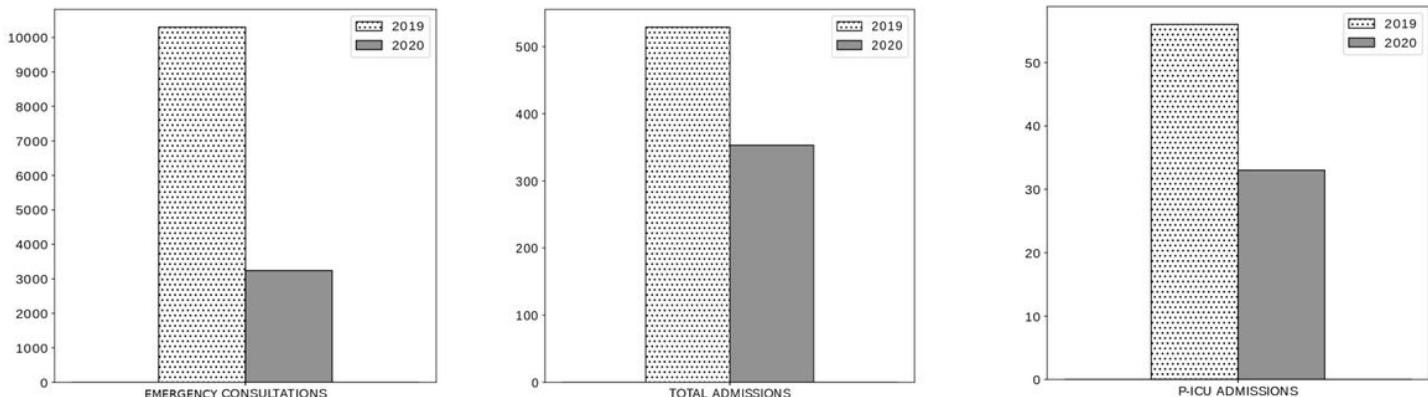


Figure 1

Pediatric medical attention given in CHN Hospital, during the fist wave of the COVID-19 Pandemic in Navarra Spain (March-June 2020) . Data are compared with the same time period in the previous year (March-June 2020) . Total Emergency Department consultations, admissions in the pediatric ward and Pediatric-ICU admissions. ECIEN-2020 study