

Impact of the Covid-19 pandemic on emergency department visits and hospital admissions in a tertiary hospital in Barcelona, Spain.

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BACKGROUND

The first cases of an unknown respiratory infection caused by an RNA virus were described at the beginning of December in Wuhan (China)^{1,2}. The World Health Organization (WHO) named the virus “2019 novel coronavirus (2019-nCoV)” on January 7th, 2020. Four days later, on January 11th, the WHO named the illness associated with this virus “the 2019 novel Coronavirus Disease (COVID-19)”. The International Committee on Taxonomy of Viruses renamed it to “Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)”.

With an incubation period between 2-14 days^{3,4}, it is defined by having high contagion capacity with an R0 transmission index of 1.4-2.5⁵ and by manifesting with rapid progression bilateral infiltrate pneumonia⁶. Characterized by affecting mainly the adult population, studies report that children account for just 1–5% of total cases^{7,8}, with symptoms being much milder. The first case in Spain (Canary Islands) was reported on January 31st. Due to the exponential increase of cases worldwide, on March 11th the WHO declared the SARS-CoV-2 pandemic. The situation in Spain was getting worse so, 3 days later, on March 14th, a state of emergency was declared, and a total lockdown was imposed in our state, with almost 10,000 reported cases and 100 deaths from the Coronavirus disease⁹. It lasted until May 4th (when phase 0 of de-escalation started) and entailed a change in our hospital pediatric department, with similar measures in hospitals in other countries^{10,11}.

In that climate of uncertainty, some measures were carried out in our hospital to deal with the massive occupation of COVID-19 patients: non-urgent surgeries, procedures and outpatient visits were canceled, and those wards or operating theaters were used as COVID-19 wards. The follow up of patients (either the outpatient visits or the general practitioners) was done by telephone. There was a relocation of the pediatric general health centers of the zone into only one and most of the specialized and junior pediatricians from the hospital helped in the adult COVID-19 wards.

Publications from different countries have reported several changes in the number of pediatric emergency referrals and child hospitalization compared to previous years¹²). Some of these studies also showed a delayed diagnosis of non-COVID-19 pathologies¹³ and a late referral of patients with severe diseases (diabetes¹⁴, cancer, septic shock, and hypoglycemia in newborns, among others¹⁵) and an increase in social problems (abuse, domestic violence and experiencing neglect by children¹⁶).

Considering the lack of studies on this topic, unlike similar studies in the non-pediatric population^{10,17,18}, we aimed to describe the impact of the SARS-CoV-2 pandemic in our pediatric department by comparing ED visits and hospital admissions in the same period (March to May) of 2020 and 2019.

MATERIAL AND METHODS

Study design and data collection

We conducted a cross-sectional observational study at Hospital Universitari Parc Taulí Sabadell (Barcelona, Spain), a third level hospital and surgical center with a 440,245-population area (approximately 70,000 under 18 years old). The hospital offers all the pediatric specialties until 18 years of age, except oncology, cardiac surgery, transplant and extracorporeal membrane oxygenation (ECMO), and includes a pediatric intensive care unit (PICU) and neonatal intensive care unit (NICU), a pediatric hospitalization ward with 42 beds, an emergency department that also treats trauma and surgery pathology and air and ground transport. The period of the study ran from March 9th to May 9th, 2019 and from March 9th to May 9th, 2020. The data was obtained through the database of the hospital. The study included patients between 0-18 years of age visited in the ED and/or admitted to our center during the study period. The study was approved by the ethics committee of the hospital (number 2020/721).

We analyzed demographic data (age and sex), triage level, procedures performed in ED, referral place and destination when discharged from the ED (home, medicine or surgery admission), length of stay in ED and final diagnoses.

Pediatric Department response to COVID-19 pandemic

Due to the lack of space to admit all COVID-19 patients to the hospital, several changes had to be made. On March 20th, the pediatric ED was transferred to another hospital area (to be able to give space to adult emergencies); and non-urgent surgical interventions were canceled. In addition, it was recommended both to the general and pediatric population, to avoid non-essential ED visits, and to use telephone resources to contact their reference pediatrician or public health emergencies system. Pediatric ED was divided into two separate sections, one with pathology suspicious of being compatible with the SARS-CoV-2 infection (fever, respiratory symptoms, abdominal pain, diarrhea, headache and anosmia/ageusia), and non-suspicious pathology. The polytrauma and cardiac arrest room were transferred to the adult area. The pediatric ward was partially occupied by adults without COVID-19, which meant a 50% decrease in available beds. There were no changes in the NICU nor in the PICU. A SARS-CoV-2 PCR was performed on all the children admitted to the hospital and, despite the severity, the ones that were positive, were admitted to the PICU as an isolation measure. There were no major changes related to the treatments performed during that period, except that nebulized treatment was replaced by inhaled treatment. All health care workers were equipped with the personal protective equipment available at the time to care for patients with suspected symptoms of SARS-CoV-2 infection.

As a result of the overflow of adults admitted to the hospital with COVID-19 and the lack of physicians, almost half of the pediatricians had to work in COVID-19 areas (wards and ICU). That led to a lack of pediatricians and consequently the work schedule got changed to a 12-hour work shift in the ED and 24-hour work shift in the PICU. There were no changes in

the neonatal ward and neither in the NICU shifts. The daily general pediatric handover and clinical sessions were canceled; handover was done just between the on-call teams.

The pediatric transport (air and ground) operated as usual except for patients with SARS-CoV-2 infection (confirmed or suspicious) that were only transferred by ground.

Statistical analysis

Demographics, emergency visits and hospital admissions characteristics were summarized using descriptive statistics; continuous variables were presented as mean \pm standard deviation or median [25th percentile-75th percentile] as appropriate. To compare both periods, we performed the Chi-square test or Fisher's exact test, for categorical comparisons, and t-Student or U Mann-Whitney test for continuous variables. Odds ratios (OR) were expressed with a 95% confidence interval (calculated by the Wilson method). A two-sided p-value less than 0.05 was considered statistically significant. All data were analyzed using IBM SPSS version 22.0 (IBM Corporation, USA).

RESULTS

Changes in ED visits

6568 visits (53.9% male) in the ED were recorded in the first period (March 9th to May 9th, 2019) and 1133 visits (55.2% male) in the second one (March 9th to May 9th, 2020). We observed a decrease of 82.7% in the number of ED visits with an OR= 0.17 (95%CI 0.16-0.18), $p<0.001$ (Table 1). In the week-by-week analysis, there was an important decrease in weeks 3 and 4 (over 90%), corresponding to March 23rd to April 5th (Figure 1).

The average age of the children visited was 6.5 ± 5.1 years in 2019 and 7.3 ± 5.6 years in 2020, $p<0.001$. There was a significant decrease in ED visits of 1–5-year-old children and an

increase of ED visits in teenagers between 13-18 years (Table 2). We did not observe differences in sex. There was a statistically significant difference between the severity of the patients visited in ED; Triage levels 1 and 2 (most severe cases) were more common in the second period, and triage level 5 (mildest cases) was more common in the first period. The readmission index (before 48h) was higher in the first period and ambulance admissions were higher in the second one. We observed a significant increase in the second period regarding blood samples, intravenous treatments, and surgery procedures, although there was no difference in image diagnosis and a significant decrease in respiratory treatments during the same period. The mean length of stay in the ED was 33 minutes longer in the second period ($p<0.001$).

We observed significant differences in diagnosis at discharge between the two periods, in those infectious pathologies related to the respiratory, gastrointestinal, otorhinolaryngology tract and a significant increase in ED visits related to surgical, nephro-urologic and cardiovascular conditions as we can see in Table 3. Trauma, neurologic and psychiatric conditions remained unchanged.

Changes in hospital admissions

198 admissions were registered in the first period and 89 in the second one (Table 4). This meant a decrease of 55.1% (47.9 – 62.2), $p<0.001$). The average age of the patients admitted in the hospital was 5.6 ± 5.3 in 2019 and 8.3 ± 5.4 in 2020 with a $p<0.001$ with no differences in sex. There was a significant increase of the relative number of patients being admitted to the hospital (3.0% in 2019 and 7.9% in 2020, $p<0.001$). We observed a significant reduction of respiratory and gastrointestinal infectious pathologies. Despite representing a higher proportion of hospital admissions, the absolute number of acute appendicitis (23 in 2019; 20

in 2020) or pyelonephritis (9 in 2019; 9 in 2020) remained unchanged when comparing both periods. The length of stay was similar between the two periods.

DISCUSSION

The lockdown led to a significant decrease in ED visits (>80%) and hospital admissions (>50%) when comparing the same period of 2019 and 2020, and to a 2.6-fold increase in the hospital admission rate. While infectious diseases decreased (probably due to lockdown and hygienic measures) traumatic and surgical conditions remained stable. Our results are similar to those reported in other countries. Italy^{19,20} [19,20], France²¹, USA^{18,22} and Holland²³ observed a decrease in ED visits between 68% and 72%. The stability of the number of ED visits related to traumatological and surgical conditions, seen more often in teenagers, could explain the reduction of the rate of younger patients visited in ED and the increase of teenagers.

There was a decrease of the absolute number of hospital admissions, but a relative increase of patients finally admitted to the hospital, as reported in other countries²⁰, and a proportional increase of admissions due to surgeries (such as appendicitis) and pyelonephritis, diseases which its pathophysiology do not change with a lockdown, social distancing or the use of mask²³. The significant increase of the procedures performed in ED, the increase of mean time spent in the ED, and the increase of critical Triage levels (1 and 2), reflects a relative increase of the severe pathology visited in ED during the lockdown compared with the same period in 2019. Most likely, such a large change is due to the decrease in visits related to infectious disease (overall respiratory and gastrointestinal disease), to the change of management of symptoms -such as pain- among parents and caregivers, due to the fear of coming to the hospital and the possibility of doing telephonic visits (through the primary

health care system and general emergency telephone number). Worth highlighting also, that the significant increase of length of stay in the ED could be related to the increase of severe pathologies, to less ratio of consultant pediatricians in the ED department, to more time-consuming procedures in addition to the need to use personal protective equipment.

Finally, even though there was a proportional increase of the admitted patients (3% vs 8% in the second period), the proportion is still low compared with other countries, such as Italy (admissions increased from 0.5-20 to 0.9-41%), Germany (from 14 to 27%), USA (from 19-20 to 22-24%) and Ireland and Netherlands (admissions ratio remained stable in 15% and 35-45% respectively)²³. This could be explained by a hyper-frequency of the ED visits in our country, probably due to a universal and easily accessible health care system.

Changes in the characteristics of both patients and pathologies seen in the ED during the lockdown, lead to a drastic change of the organization of the hospitals in terms of physical space, infrastructures and human resources. As described by Comelli et al.¹⁰ this pandemic made us realize that hospitals must be constantly prepared with enough medical staff, equipment, flexibility, and capacity to adapt quickly, being able to work in community-centered care instead of individual-centered care.

As a result of the onset of telemedicine and the rapid increase in its use during the pandemic period¹⁸, as well as the increase of self-management of symptoms by parents before consulting ED, there has been a decrease of visits in ED. If we continue working in this innovative direction, empowering telemedicine systems, and delivering health education to the population, we could achieve a better health system with more time for patients who really need urgent attention as well as minimize its cost. On the other hand, a well described

educational and telemedicine program with useful tools that identify those patients at risk, would be needed to prevent diagnostic delays and neglect.

In conclusion, the effects of lockdown during the COVID19 pandemic led to an important and significant decrease of ED visits and hospital admissions mostly due to a reduction in infectious diseases, although hospital admission rate increased. Telemedicine, coordination between primary health care and hospitals and public health education interventions are important to have a better and more cost-effective health care system.

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Figures

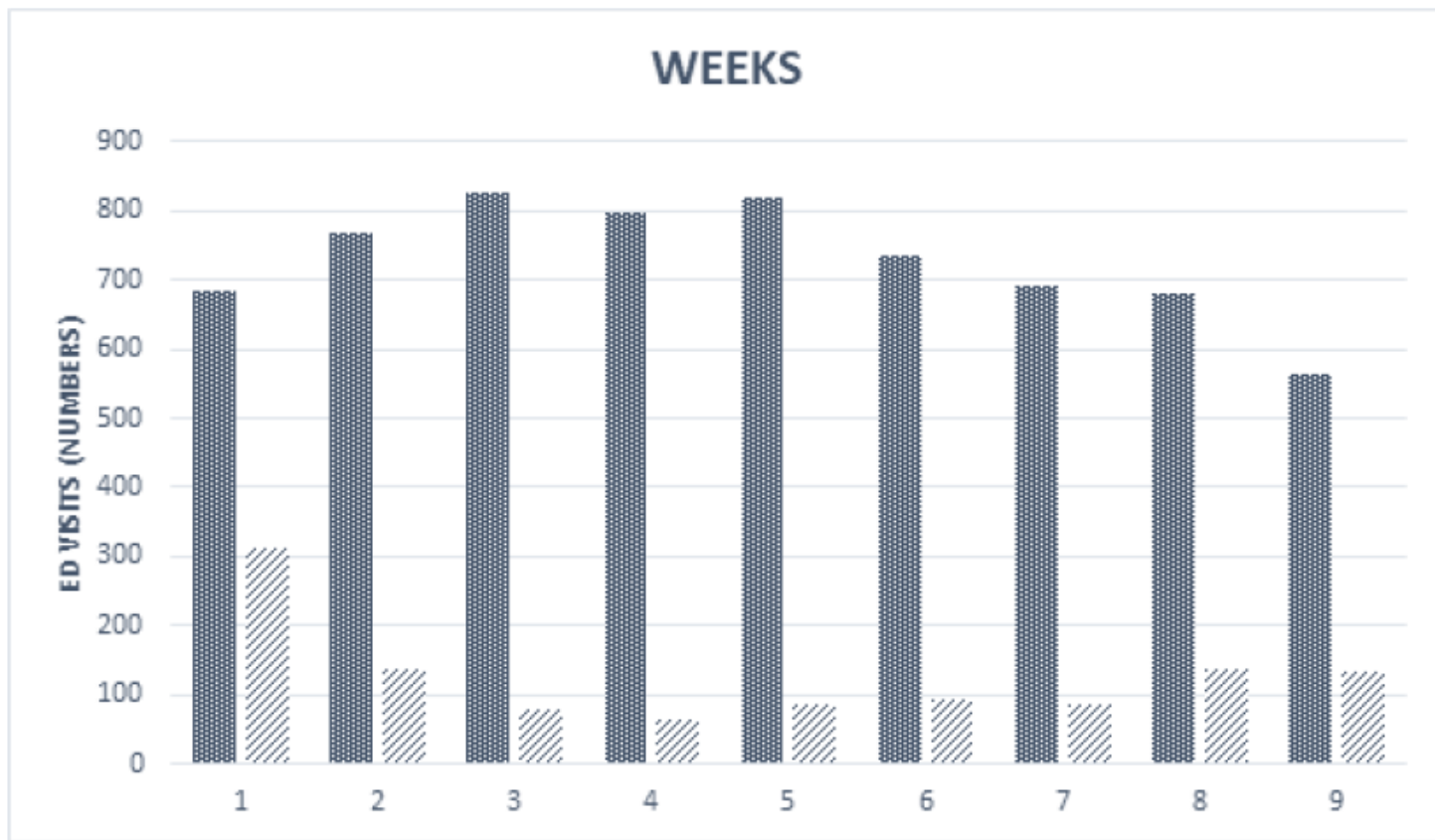


Figure 1

Trends in ED visits during the study period (March 9th-May 9th) in weeks comparing 2019 and 2020.

The abscissa axis represents each week March 9th to May 9th . Each week (1,2,3...) has two columns: the left column represents 2019 and the right column 2020. Ordered axis represents the number of emergency department visits.

Supplementary Files

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