## Collateral damage in pediatric scenarios requiring urgent care during the COVID-19 pandemic

*Efectos colaterales de la pandemia COVID-19 sobre la patología pediátrica urgente*

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In response to the COVID-19 pandemic, the Spanish Government declared a State of Alarm on March 14, 2020, the main measure of which was population confinement. Some authors have expressed concern about the possible delay in seeking emergency healthcare (EH)[1,2].

In the Pediatric Emergency Department (PED) of the Hospital Universitario La Paz, Madrid, we conducted a retrospective observational study with the aim of analyzing whether, during the period of confinement in which minors were prevented from leaving their homes except for justified cause (March 14 to April 26, 2020), there was a delay in seeking EH for some pediatric processes. This PED was one of the two centers where urgent pediatric hospital care was centralized in the Community of Madrid during the period of alarm. For comparisons, the equivalent time period of the previous year was considered.

Pathologies whose prevalence is not related to interpersonal contact were analyzed: debut of type 1 diabetes mellitus (T1DM), fractures, febrile urinary tract infection (UTI), acute appendicitis and neonatal hyperbilirubinemia. The following cases were considered as delay in receiving EH: cardinal symptoms of diabetes of more than 2 weeks of evolution, search for EH more than 2 hours after the trauma that caused the fracture in the case of open fractures or 24 hours in the case of closed fractures[3], UTI with fever of more than 72 hours of evolution, acute appendicitis with abdominal pain of more than 48 hours of evolution and total serum bilirubin (TSB) with phototherapy values. To assess the severity and possible short-term consequences of delay in receiving EH, the following were analyzed: severity of diabetic ketoacidosis (DKA)[4], complicated fractures or fractures requiring multiple attempts at closed reduction or surgical indication, clinical presentation, C-reactive protein (CRP) values and the need for admission in febrile UTI, diagnostic confirmation of complicated appendicitis[5] and duration of admission, and the need for intensive phototherapy treatment[6] and degree of newborn (NB) weight loss.

For quantitative variables, the Kolmogorov Smirnov test was used to test for normality, using Student's t test or the Mann-Whitney U test as appropriate. To compare frequencies, the chi-square or Fisher's exact test statistics were used. The study was approved by the center's ethics committee.

In 2020, there were 2,413 visits compared to 5,966 in 2019, a 59.6% decrease. Admission rates were 13.8% and 7.3% respectively. The number of cases and distribution of patients by sex, age and triage levels were similar in both years (Table 1), except for fractures (milder triage levels in 2020) and hyperbilirubinemia (male predominance in 2020).

Patients diagnosed with T1DM in 2020 referred for consultation later, with 75% of them reporting cardinal symptoms of more than 2 weeks' evolution. The incidence of DKA (75%) and mean HbA1c (13.5%) were higher in 2020 (Table 2). Regarding fractures, in 2020 the mean time elapsed from trauma to consultation was higher (35 SD: 57

**Table 1.** Characteristics of study patients: comparison between 2019 and 2020

| | Male patients n (%) | p | Age[a] M [min-max] | Age[a] Mean (SD) | p | Triage level (%) II | III | IV | p |
|---|---|---|---|---|---|---|---|---|---|
| **Debut DMT1** | | 1 | | | 1 | | | | 0.200 |
| 2019 | 6 (66.6) | | 8.4 [3.5-12] | | | 50 | 50 | 0 | |
| 2020 | 4 (75) | | 8.5 [6.5-15] | | | 100 | 0 | 0 | |
| **Fractures** | | 0.116 | | | 0.488 | | | | 0.025 |
| 2019 | 26 (69.2) | | | 6.5 (4.4) | | 0 | 54 | 46 | |
| 2020 | 29 (48.3) | | | 5.7 (4.4) | | 0 | 24 | 76 | |
| **Febrile UTI** | | 0.853 | | | 0.322 | | | | 0.647 |
| 2019 | 20 (40) | | 1.4 [0-16] | | | 0 | 50 | 50 | |
| 2020 | 21 (60) | | 0.8 [0-12] | | | 0 | 43 | 57 | |
| **Acute appendicitis** | | 0.339 | | | 0.836 | | | | 0.497 |
| 2019 | 26 (57.7) | | | 10.4 (3.5) | | 4 | 44 | 52 | |
| 2020 | 33 (69.7) | | | 10.6 (3.2) | | 0 | 39 | 61 | |
| **Neonatal hyperbilirubinemia** | | 0.038 | | | 0.274 | | | | 1 |
| 2019 | 30 (40) | | | 7.2 (4.5) | | 0 | 97 | 3 | |
| 2020 | 25 (68) | | | 6.1 (3.0) | | 0 | 100 | 0 | |

[a]Age: age is expressed in days of life for the neonatal hyperbilirubinemia group and in years for the other groups. Mean and SD were used in diseases with normal distribution of the variable age; otherwise, median and range were used.
M: median; min: minimum; min: minimum; max: maximum; SD: standard deviation; T1DM: type 1 diabetes mellitus; UTI: urinary tract infection.

vs. 10 SD: 14 hours; p = 0.003), with a higher percentage of patients who consulted after more than 24 hours (Table 2). A total of 100% were closed fractures. There was a decrease in the rate of closed reductions and surgical corrections, associated with a non-significant decrease in the number of unstable fractures compared to 2019. In both periods, there were no associated complications and in 100% of cases the first attempt at closed reduction was successful. The percentage of admissions was lower in 2020. The percentage of patients with febrile UTI who consulted after 72 hours was similar. No significant differences were observed in the clinical and evolutionary characteristics (Table 2). Patients diagnosed with acute appendicitis consulted later in 2020, and the incidence of complications and the rate of postoperative hospitalization of more than 72 hours was higher (Table 2). There was a 240% increase in the number of admissions due to the need for phototherapy. Patients in 2020 had greater weight loss from birth, tripling the rate of patients with loss greater than 7%, and higher TSB numbers (Table 2). Eight patients in 2020 had a figure ≥ 20 mg/dl, compared to only one in 2019.

Our study shows that the number of patients treated decreased during the confinement. Recommendations not to overcrowd health services and fear of contagion played a fundamental role. Although the decrease in the incidence of infectious pathology, due to the suspension of schooling, was probably a contributing factor, we believe that this data reflects the overuse of the PED for consultations for "minor" processes that can be resolved in primary care. This is a common problem[7], but there is no unanimous interpretation of its definition or even whether it is really appropriate to carry out interventions (and which ones) to try to minimize it, without this having a negative impact on the search for ASU by patients who do need it[8].

Although our percentage of patients with prolonged cardinal clinic is consistent with data from the European Childhood Diabetes Registries collaborative project[9], for our PED it was an increase over 2019. The same was true for the incidence of DKA. In 2019, the one observed (33.3%) was similar to that of the Spanish Collaborative Study (39.5%)[10]; however, during 2020 it rose to 75%.

Despite the confinement, a similar number of fractures were treated, probably due to the increase in domestic accidents[11]. It is striking to note the high percentage of patients who, in 2020, consulted more than 24 hours after the trauma, without a worse outcome. Possibly, the restriction of physical activity reduced the risk of serious fractures, which would justify the reduced need for surgical correction and hospitalization.

Confinement did not delay the diagnosis of patients with febrile UTI. Possibly, as they were young patients with high fever, parents did not defer the search for ASU. Consequently, their clinical pattern and evolution were similar.

In contrast, patients with appendicitis consulted significantly later, a factor related to a higher rate of perforation and complications[12-14]. We believe that, despite not finding significant differences, from a clinical point of view this is the disease in which confinement has had the most negative impact on its short-term evolution.

The increase in hospitalizations and intensive treatment for neonatal hyperbilirubimia does not seem to be related to a delay in the search for ASU. A contribution may have been made by the modification of the healthy newborn program during the pandemic (early discharge at 24 hours of life), preventing the detection of cases of early jaundice on the ward before discharge, as has been suggested in some studies[15]. The greater weight loss with respect to birth may also have been favored by this change in the program. In our opinion, these results highlight the importance of the functions of primary care, which have been modified during this crisis.

In the two diseases in which a delay in the search for ASU was observed, the triage levels (determined by pain and general condition, among others) were milder (fractures) or similar (appendicitis). Possibly, in the first case because of the lesser severity of the fractures; in the second, because the complications of appendicitis are not always accompanied by a condition with detectable systemic repercussions in the initial assessment.

The retrospective nature of the study precludes evaluation of possible long-term consequences of diagnostic delays. Patients who suffered trauma associated with fractures during the confinement period, but who consulted the emergency department after the end of the confinement period, were not included in our analysis. On the other hand, the single-center nature of the study and the limited sample size make it necessary to interpret these results with caution. In conclusion, the COVID-19 health crisis has led to delays in care in certain diseases, with increased hospitalization and complication

**Table 2.** Analysis of delay in seeking emergency health care, severity and short-term consequences

| | 2019 n (%) | 2020 n (%) | p |
|---|---|---|---|
| **Debut DMT1 (number of patients)** | **6** | **4** | |
| Cardinal symptoms > 14 days | 3 (50) | 3 (75) | 0.571 |
| pH [mean (SD)] [range] | 7.29 (0.11) [7.13-7.39] | 7.19 (0.09) [7.11-7.32] | 0.169 |
| DKA | | | |
| No DKA | 4 (66.6) | 1 (25) | |
| Moderate DKA | 2 (33.3) | 3 (75) | 0.524 |
| HbA1c (%) [mean (SD)] [range] | 11.9 (1.5) [10.1-14.4] | 13.5 (2.2) [11.8-16.7] | 0.171 |
| Glucose (mg/dl) [mean (SD)] [range] | 442 (195) [277-802] | 348 (111) [272-511] | 0.416 |
| **Fractures (number of patients)** | **26** | **29** | |
| Trauma > 24 hours ago[a] | 1 (3.8) | 8 (27.6) | 0.027 |
| Closed reduction | 9 (34.6) | 2 (6.4) | 0.016 |
| Surgical correction | 3 (11.5) | 2 (6.4) | 0.065 |
| Fracture type | | | |
| Unstable | 9 (34.6) | 4 (12.9) | 0.064 |
| Hospitalization | 9 (34.6) | 1 (3.4) | 0.004 |
| **Febrile UTI (number of patients)** | **20** | **21** | |
| Fever > 72 hours | 2 (10) | 1 (4.8) | 0.606 |
| Fever > 39ºC | 10 (50) | 11 (52.3) | 0.879 |
| CRP (mg/dl) [mean (SD)] [range] | 99 (96) [8-339] | 126 (81) [17-285] | 0.342 |
| Hospitalized patients | 6 (30) | 8 (38) | 0.585 |
| **Acute appendicitis (number of patients)** | **26** | **33** | |
| Abdominal pain > 48 hours | 0 (0) | 6 (18.2) | 0.030 |
| Complicated[b] | 5 (19) | 11 (33) | 0.226 |
| Hospitalization > 72 hours | 6 (23) | 15 (45.5) | 0.075 |
| **Neonatal hyperbilirubinemia** | **30** | **25** | |
| Need for phototherapy[c] | 5 (16.7) | 12 (48) | 0.012 |
| TSB (mg/dl) [mean (SD)] [range] | 14.6 (3.5) [6.5-21.5] | 18.1 (3.4) [11.5-25.7] | 0.001 |
| % Weight loss [mean (SD)] [range] | 2.9 (4.9) [0-11] | 5.4 (4) [0-12] | 0.058 |
| Weight loss > 7% | 4 (13.3) | 10 (40) | 0.032 |
| Intensive phototherapy | 0 (0) | 5 (20) | 0.015 |

[a]100% of patients had closed fractures.
[b]Complicated appendicitis was considered to be: gangrenous appendix, perforated appendix with/without abscess, periappendicular phlegmon and/or peritonitis (American Association for the Surgery of Trauma)[12].
[c]The need for phototherapy implied hospital admission of the patients.
n: number of cases; m: mean; SD: standard deviation; DMT1: type 1 diabetes mellitus; DKA: diabetic ketoacidosis; HbA1c: glycosylated hemoglobin; UTI: urinary tract infection; CRP: C-reactive protein; TSB: total serum bilirubin.

rates in some processes. This should be considered when planning emergency pediatric healthcare in new waves of the pandemic, including the roles of primary and hospital care. On the other hand, it has shown that access to emergency services does not always reflect a real need for emergency care.

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