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Italian COVID-19 epidemic: effects on paediatric emergency attendance—a survey in the Emilia Romagna region

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ABSTRACT

Objective To evaluate the effect of the COVID-19 epidemic on paediatric emergency department (ED) attendance in a region of Northern Italy.

Methods A survey was proposed to six out of nine paediatric EDs in the Emilia Romagna region to evaluate attendance data, distribution by age and gender, triage code score, outcome of clinical course, number of hospitalisations and the distribution of patients by disease. Data were collected during March 2020 and compared with that of March 2019.

Results A drop in paediatric ED attendance of more than 83.8% was observed, with a higher percentage of infants and severe triage scores. The proportion of patients hospitalised was significantly higher in 2020 than in 2019 (p value: <0.001). The effect size for the comparison of proportions of hospitalised patients was 0.379. Looking at the distribution of attendance by type of disease, a significantly different distribution was highlighted (p value: <0.00001, Cramer's V); there was a greater proportion of patients presenting to paediatric EDs with poisonings (effect size=0.07), psychiatric pathologies (effect size=0.110), head injuries (effect size=0.167) and fever (effect size=0.212).

Conclusions Our survey suggests that in the first month of the COVID-19 epidemic in Italy, there has been an increase in delayed attendance and provision of care of potentially severe diseases in paediatric EDs. Hospital and community paediatricians should be aware of this phenomenon and adopt appropriate strategies to prevent this danger, as it may affect children more seriously than COVID-19 itself.

What is known about the subject?

- Up to now, only a few studies showed that, during the COVID-19 pandemic, paediatric emergency department (ED) attendances decreased compared with the same period of the previous year.
- Children with COVID-19 appear to be mainly asymptomatic or experience mild symptoms, resulting in a small number of COVID-19-related paediatric ED attendances.
- During the COVID-19 pandemic, there is a risk of delayed attendance to hospital care for non-COVID-19 severe conditions.

What this study adds?

- At the start of the Italian COVID-19 epidemic, a drop of more than 80% in paediatric ED overall attendances was observed with a higher percentage of children resulting in hospitalisations due to more severe conditions.
- There was a greater proportion (p<0.05) of patients presenting with poisonings, psychiatric pathologies, head injuries and fever.
- The impact of the delayed provision of care for non-COVID-19 severe conditions may be even worse than COVID-19 itself.

INTRODUCTION

Since December 2019, a novel coronavirus (SARS-CoV-2) infection has rapidly spread worldwide. At the end of February 2020, the first cases of coronavirus disease 2019 (COVID-19) were also identified in Italy in the province of Lodi, in the south of the Lombardy region. On March 11, the WHO declared the global pandemic of COVID-19.

Simultaneously with the onset of the outbreak in the Lombardy region, in the neighbouring Emilia Romagna region, the first cases of suspected patients were assisted in the paediatric emergency department (ED) of the Piacenza City Hospital. Subsequently, the entire Italy was progressively struck by the spread of the virus.[1]

Although little is known about the COVID-19 course in children, it seems that they are mainly asymptomatic or present with mild symptoms, resulting in low rates of hospitalisation.[2 3]

Since the beginning of March, after school closure and the adoption of social distancing measures by the Italian Government, there has been a dramatic decrease in Italian paediatric ED attendance[4] as also reported by Isba and colleagues in the UK.[5]

Our study aimed at evaluating the effect of the COVID-19 epidemic on paediatric ED attendances in the Emilia Romagna region in order to assess the characteristics of paediatric ED attendances during March 2020 and possible implications with regards to the use of paediatric ED.

METHODS

The paediatric healthcare system in Italy is part of the National Health System. It is made up of three main levels of intervention: primary care, which is provided by the so-called 'family paediatricians network'; secondary care, which includes paediatric EDs and general paediatrics units; and tertiary care, which includes specialty paediatrics units. Up to 14 years of age, each child may have a referral family paediatrician (FP), which is mandatory for children up to 6 years. Despite this provision of care and assistance, the decision to go to a paediatric ED is made more often by parents alone than under FP's advice.

A survey was proposed to the paediatric ED of the nine provinces of Emilia Romagna with the aim to collect and compare activity data during March 2020 with that of March 2019. The data were extracted in each hospital from a regional paediatric ED attendance database by a delegated paediatrician. Paediatric ED attendance data, the distribution by age and gender, and the severity of triage code (red, yellow, green and white) were evaluated and compared with the same month in 2019. The outcome of the clinical course in the paediatric ED was evaluated, as well as the number of admittances to the Short-stay Observation and Assessment Unit (SOAU; duration of stay: less than 36 hours) and outcome, the number of hospitalisations into paediatrics wards and the distribution of patients by disease group. Finally, information was collected on the cases that came to the paediatric ED with suspected SARS-CoV-2 infection.

Statistical analysis included: χ^2 test for differences in types of disease between the two study periods; two-sample Wilcoxon-Mann-Whitney test for comparing age medians and two-sample Z-test to compare the admittance proportions (eg, SOAU vs total admittances). A Jonckheere-Terpstra test was used to assess whether the severity of the attendance by triage code increased from 2019 to 2020. Statistical significance was assumed at a p value <0.05. For the Z-test comparing proportions, the effect sizes were computed according to Cohen's methodology.[6]

RESULTS

Six paediatric EDs participated (Piacenza, Reggio Emilia, Modena, Ravenna, Forlì and Rimini Hospitals), representative of most of the regional territory.

Our survey included infants and children under the age of 14 years, living in the mentioned provinces, encompassing a global figure of 332 212, which covers 61% of the same age population of the entire region.

Data from our study are summarised in tables 1 and 2. In March 2020 compared with March 2019, a drop of more than 80% in paediatric ED overall attendances was observed.

A significantly higher percentage of attendance of infants under the age of 1 year (p value: <0.00001) was documented in March 2020 compared with the same month in 2019, both as overall data and as singular paediatric ED.

In the distribution of attendances by triage code, the proportion of yellow codes increased significantly; nevertheless, the total number of severely ill children decreased along with the drop of overall attendances. The green codes, the most frequent attendance category, have remained substantially unchanged, whereas the white codes have decreased significantly (table 3).

Table 1 Emergency attendances and their characteristics from six paediatric EDs in the Emilia Romagna region

Paediatric ED attendance #	March 2019	%	March 2020	%	% Delta	P value*
Piacenza	1400		179		−87.2	
Reggio Emilia	1255		261		−79.2	
Modena	2087		437		−79.6	
Ravenna	960		179		−81.3	
Forlì	504		97		−80.7	
Rimini	1694		238		−85.9	
Overall attendances	7900		1391		−83.8	
Male	4366	55.3	766	55.1	−0.2	
Female	3534	44.7	625	44.9	+0.2	
Mean age (years)	4.74		4.71			0.807
Median age (years)	4.27		4.06			
Under the age of 1 year	951	12.9	247	19.1	+5.2	<0.00001

*Statistical significance (p value: <0.05) is related to percentages.
ED, emergency department.

Table 2 Relative frequency (percentage) of age distribution in the two study periods

Age (years)	March 2019 (%)	March 2020 (%)
<1	12.9	19.1
1	13.1	12.1
2	11.3	10.7
3	10.4	7.6
4	8.8	9.6
5	7.0	4.4
6	6.0	5.8
7	5.1	3.6
8	4.8	4.3
9	5.0	3.9
10	4.4	4.7
11	3.6	3.2
12	3.2	4.3
13	2.8	3.7
>13	1.7	3.0

Of the total number of paediatric ED attendance, the proportion of patients admitted to SOAU was significantly higher in 2020 than in 2019 (p value: <0.01). This result is confirmed both by the aggregate data and by each paediatric ED. Additionally, there was an increase in subsequent hospitalisations. By comparing the 2 months, there was also a significantly greater percentage of hospitalised children (p value: <0.001) (table 3). The effect size for the comparison of proportions of hospitalised patients was 0.379.

As we did not primarily focus on waiting time from triage to the first medical examination and/or length of stay until discharge or hospitalisation in our survey, we did not extract these data from all paediatric ED databases. Nevertheless, we were able to collect data from our paediatric ED database in the Piacenza Hospital; mean and median waiting time were 15 and 8 min in 2020, respectively, compared with 56 and 41 min in 2019. The mean and median length of stay were 70 and 48 min in 2020, respectively, and 126 and 113 min in the same period of the previous year. Although we could not carry out a test procedure (as we did not have access to individual-level data), the marked observed differences and the large sample sizes are noteworthy.

Looking at the proportional distribution of attendance by type of disease, a significantly different distribution was highlighted (p value: <0.00001). In relative terms, we observed a statistically greater proportion of attendance due to fever, head injuries, poisonings and psychiatric pathologies, whereas those due to acute respiratory and gastrointestinal diseases, and abdominal pain dropped significantly. Additionally, no significant variation in attendance for headache, seizure and unintentional trauma was found (table 4). As the Jonckheere-Terpstra test was used to compare the severity of the attendance in the two periods, we have that the null hypothesis (no severity difference) is rejected, so we can conclude that the severity of the attendance as classified by triage codes was higher in 2020 than in 2019 (p value: <0.00001).

The diagnoses of the children hospitalised into the paediatrics unit are shown in table 5.

During the monitored period, 103 nasopharyngeal swabs for suspected SARS-CoV-2 infection were collected in the included paediatric EDs, of which 26 tested positive; 6 of these required hospitalisation into paediatrics units, but none were intubated or required non-invasive ventilation.

DISCUSSION AND CONCLUSIONS

The data from our study show a consistent drop in paediatric ED attendance during the COVID-19 epidemic onset in accordance with other experiences recently

Table 3 SOAU overall admissions and overall hospitalisations from the paediatric ED and SOAU; triage codes' distribution

Paediatric ED attendance	March 2019	%	March 2020	%	% Delta	P value*
SOAU overall admissions	563	7.1	132	9.5	+2.4	<0.01
Overall hospitalisations from paediatric ED	553	7.0	271	19.5	+12.5	<0.001
Overall hospitalisations from SOAU	88	15.6	41	31.0	+14.6	<0.001
Overall attendances by triage codes†						
Red	23	0.3	9	0.65	+0.35	0.065
Yellow	785	9.9	209	15.0	+5.1	<0.001
Green	5599	70.9	1021	73.4	+2.5	0.059
White	1493	18.9	152	10.9	−8	<0.001
Jonckheere-Terpstra test comparing the severity of the attendance						<0.00001

*Statistical significance (p value:<0.05) is related to percentages.
†Four-Level Triage Score System: red code: emergency; yellow code: urgency; green code: deferable urgency; white code: not urgency.
ED, emergency department; SOAU, Short-stay Observation and Assessment Unit.

Table 4 Actual numbers and proportion of attendance (in brackets) in 2019 and 2020 for each disease, with p values associated with the test for the equality between two proportions and the effect size (those associated with non-significant differences are reported in grey)

Disease	March 2019 (%)	March 2020 (%)	P value	Effect size
Headache	111 (1.4)	18 (1.3)	>0.1	0.009
Febrile seizures	97 (1.2)	20 (1.4)	>0.1	0.018
Epilepsy and other neurological diseases*	158 (2.0)	43 (3.1)	<0.05	0.070
Fever**	1185 (15.0)	324 (23.3)	<0.00001	0.212
Acute respiratory disease**	2069 (26.2)	222 (15.9)	<0.00001	0.254
Acute gastrointestinal disease**	1196 (15.1)	93 (6.7)	<0.00001	0.275
Abdominal pain**	789 (10.0)	97 (7.0)	<0.001	0.108
Head injury**	238 (3.0)	90 (6.5)	<0.00001	0.167
Accidental trauma	467 (5.9)	95 (6.8)	>0.1	0.037
Poisoning*	57 (0.7)	20 (1.4)	<0.05	0.070
Psychiatric disease**	23 (0.3)	16 (1.2)	<0.0001	0.110
Others	1510 (19.1)	353 (25.4)	<0.00001	0.152

Significance levels: **p<0.01; *p<0.05.

reported in the literature.[4 5] This phenomenon may depend on a number of possible reasons. The recommendations issued by the Italian Government regarding social distancing and the indications to minimise hospital attendance, especially in the epidemic hotspot area, may have had an immediate effect. School closures have certainly had an impact on the transmission rate of acute infectious diseases, in particular those affecting the respiratory and gastrointestinal tracts, as shown from our data. Social distancing itself has been likely responsible for the lower incidence of accidental traumas.

Another possible reason that may have contributed to the dramatic decrease in paediatric ED attendance is the fear of contracting SARS-CoV-2 infection by entering hospitals, as considered a place at a high risk of contagion. This led to a sharp reduction of the so-called inappropriate use of paediatric ED, mostly due to parental anxiety or convenience, as reflected by the decreased rate of white codes in March 2020. This fact could be a positive externality of the pandemic, as the use of paediatric EDs was indirectly limited for diseases that do not require access to emergency services and that are at a risk of over-medicalisation.

Table 5 Actual numbers and percentage (in brackets) of children hospitalised, by diagnosis

Diagnosis	March 2019, N (%)	March 2020, N (%)
Headache	5 (0.91)	1 (0.37)
Febrile seizures	39 (6.88)	13 (4.80)
Epilepsy and other neurological diseases	33 (5.98)	13 (4.80)
Fever	67 (12.14)	27 (9.96)
Acute respiratory disease	142 (25.72)	88 (32.47)
Acute gastrointestinal disease	32 (5.80)	13 (4.80)
Abdominal pain	23 (4.17)	16 (5.90)
Head injury	5 (0.91)	7 (2.58)
Accidental trauma	28 (5.07)	10 (3.69)
Poisoning	7 (1.27)	0 (0.00)
Psychiatric disease	17 (3.08)	7 (2.58)
Others	155 (28.08)	76 (28.04)

In case of clinical suspicion of SARS-CoV-2 infection, the nasopharyngeal swab was collected in paediatric ED; only a few selected cases needed admission into the paediatrics unit, thus confirming the mild clinical course of COVID-19 in children.

The results of our survey, in particular, the proportional changes in the causes of attendance, suggest the potential risks linked to the reduced use of a paediatric ED due to the COVID-19 outbreak, which includes the risk of the delayed provision of care of potentially severe diseases and/or serious conditions.[4] We believe it is worth of interest to evaluate whether the documented delay in the use of health services could also concern children with chronic pathologies and/or with serious disabilities requiring intensive and continuous care, as well as the most vulnerable children of families of the lower socioeconomic classes.

Finally, with regard to the implications on resource utilisation, the epidemic required a structural reorganisation of paediatric EDs in order to control the risk of contagion, including the redesigning of tracks and spaces and the provision of adequate protective equipment for the health personnel. As a consequence of this rearrangement, each paediatric ED had to face higher costs than those incurred in March 2019.

As the pandemic phase may not be short-lived, we believe that paediatric ED, hospital and community health professionals should adopt appropriate strategies

to prevent the potential danger resulting from delayed diagnoses and therapies. In the absence of these, children might be more seriously affected by this pandemic 'side effect' rather than by COVID-19 itself.

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