

## REGULAR ARTICLE

# The first winter of social distancing improved most of the health indexes in a paediatric emergency department

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## Abstract

**Aim:** We compared visits to a tertiary level paediatric emergency department (PED) in Italy, during winter 2020–2021, when COVID-19 social distancing measures were in place, with winter 2019–2020.

**Methods:** This was a retrospective analysis of an electronic database. We obtained the number of visits and the ages, main complaints, triage codes, discharge diagnoses and outcomes of patients who accessed the PED from the 1 October 2020 to 28 February 2021. These were compared to the same period in 2019–2021.

**Results:** Visits fell by 52%, from 10982 in 2019–2020 to 5317 in 2020–2021 ( $p < 0.0001$ ). The reductions were 52% in neonates, 58% in infants, 53% in toddlers, 61% in preschool children, 48% in school children and 46% in adolescents. Non-urgent and urgent triage codes declined. Respiratory and gastrointestinal infections fell by 72% and 71% respectively. Injuries declined by 42%, mainly among adolescents. Accidental intoxication, psychiatric symptoms and substance or alcohol abuse declined by 24%, 33% and 64%. Hospital admissions reduced by 8% and admissions to intensive care fell by 29%.

**Conclusion:** During the first winter of pandemic social distancing visits to an Italian PED fell by 52%, with higher reductions in younger children and infants, and hospital admissions fell by 8%.

## KEYWORDS

discharge diagnoses, paediatric emergency department, pandemic, social distancing, triage codes

## 1 | INTRODUCTION

The COVID-19 pandemic started to spread through Italy at the end of February 2020 and a strict national lockdown was put in place from the 11 March to 3 May 2020. People were asked to stay at

home unless it was essential for them to go out. Schools were closed, people worked at home if they could, and sporting activities were cancelled. The second wave of the pandemic started in October 2020 and continued throughout the winter until January 2021. A series of social distancing measures were put into effect to limit

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**Abbreviations:** PED, paediatric emergency department; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

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the burden of the second wave on the national healthcare system. These included the mandatory use of face masks over 5 years of age, distance learning and high-school closures from 14 years of age, hand washing, night curfews, prohibitions on gatherings and no indoor sports activities. It also included contact tracing and quarantine for people who tested positive for the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Some of the restrictions were different to the strict lockdown measures seen during the first wave. Work places and some commercial premises remained open, outdoor sporting activities continued and people were allowed to circulate. However, bars, clubs, restaurants, dance halls, theatres, cinemas and big shopping centres remained closed.

Several studies, performed in different countries, have described the effect of the strict national lockdown on paediatric emergency departments (PEDs),<sup>1-6</sup> but limited data are available about the association between the presence of social distancing measures and the overall epidemiology of PED visits.

The main aim of this study was to describe the difference in the number of PED visits between 1 October and 28 February winter season in 2020–2021, when pandemic restrictions were in place, and 2019–2020, before the pandemic hit Italy. The secondary aim was to compare the type of visits to the PED in the two periods, paying particular attention to trends in urgent and emergency cases, type of diagnoses and hospital admissions.

## 2 | PATIENTS AND METHODS

We conducted a retrospective study on the epidemiological characteristics of patients who accessed the PED of the tertiary level, university teaching, children's hospital, Institute for Maternal and Child Health IRCCS Burlo Garofolo, Trieste, Italy. Trieste is a city with 200,000 inhabitants, which is located in Friuli Venezia Giulia region of North East Italy. The Hospital has the only PED in the city and each year it provides treatment to approximately 25,000 patients from 0 to 17 years of age. The Institutional Review Board of the Institute provided ethical approval for the study protocol (RC 10/2020) and waived the need for informed consent due to the retrospective nature of the study.

We compared the number of visits, and the main characteristics of those visits, from the 1 October 2020 to 28 February 2021. These dates were then compared with the same period in 2019/2020. The data were collected from the PED's electronic database. We collected: the date of the visit, the patient's demographics, the nursing triage code and the reason why they visited the PED and the discharge diagnosis. Data were also collected on whether they were admitted and to which ward.

The patients were stratified by age: neonates (0–28 days of life), infants (29 days to 11 months), toddlers (1–2 years), preschool children (3–5 years), school children (6–12 years) and adolescents (13–17 years). The PED patients were triaged by paediatric nurses who used the Italian national triage category system, which comprises four priority levels of increasing severity: white for not urgent, green for minor urgency, yellow for urgent and red for emergencies and resuscitation.

### KEY NOTES

- This study compared visits to a tertiary level paediatric emergency department (PED) in Italy in winter 2020–2021, when pandemic measures were in place, with winter 2019–2020.
- PED visits fell by 52%, from 10982 to 5317, with higher reductions in infants and young children who had not started school.
- Non-urgent and urgent triage codes declined, hospital admissions fell by 8% and intensive care admissions fell by 29%.

We categorised the diagnoses as follows: injuries, infectious diseases, psychiatric conditions, surgical diseases and other diagnoses. We categorised infectious diseases as follows: respiratory, gastroenterological, dermatological infections, sepsis and meningitis and other infections.

### 2.1 | Statistical analysis

Absolute frequencies and percentages were used to describe categorical variables and the chi-square test was used to evaluate the differences in the number of visits between the October to February winter seasons in 2020–2021 and 2019–2020. Fisher's exact test or the chi-square test were used to verify the associations between categorical variables, namely triage codes, reasons for visits, diagnoses and outcomes, in the two periods. The variations in the number of visits between the two study periods were reported as percentages. A *p* value of <0.05 was considered significant. All the analyses were conducted with SAS software, version 9.4 (SAS Institute Inc.).

## 3 | RESULTS

Visits to our Italian PED between October and February fell by 52%, from 10982 in 2019–2020 to 5317 in 2020–2021 (*p* < 0.0001). [Table 1](#) shows the main characteristics of the patients who arrived in our PED during the two study periods, including their demographical characteristics, triage codes, main complaints, discharge diagnoses, admission status and ward.

### 3.1 | Age groups

Visits reduced in all age groups, with the biggest reduction in preschool children aged 3–5 years: 52% in neonates, 58% in infants, 53% in toddlers, 61% in preschool children, 48% in school children and 46% in adolescents.

TABLE 1 Demographic characteristics of patients accessing the PED during the pandemic and pre-pandemic winters from 1 October to 28 February, together with triage codes, main complaints, discharge diagnoses, admissions and wards

	Pandemic 2020–2021	Pre-pandemic 2019–2020	Percentage change	p value
Number of visits, number	5317	10982	–52%	<0.0001
Female sex, n (%)	2283 (42.9%)	5123 (46.6%)		<0.0001
Age, number:				
Neonates (0–28 days)	94	197	–52%	0.91
Infants (29 days to 11 months)	395	940	–58%	0.01
Toddlers (1–2 years)	880	1886	–53%	0.32
Preschool children (3–5 years)	729	1882	–61%	<0.0001
School children (6–12 years)	1917	3668	–48%	0.001
Adolescents (13–17 years)	1302	2409	–46%	0.0003
Triage code, number:				
Non-urgent (white)	1781	3426	–49%	0.003
Minor urgency (green)	3087	6701	–54%	0.0003
Urgent (yellow)	431	826	–48%	0.19
Emergency/resuscitation (red)	18	29	–38%	0.41
Main complaint, number:				
Injuries	2076	3597	–42%	<0.0001
Abdominal pain	249	448	–45%	0.07
Vomiting	105	360	–71%	<0.0001
Respiratory distress	191	453	–58%	0.10
Fever	369	881	–58%	0.02
Headache	91	166	–45%	0.34
Dizziness	16	44	–67%	0.32
Agitated state	43	73	–41%	0.31
Chest pain	47	87	–56%	0.54
Diarrhoea	61	150	–59%	0.25
Cough	177	940	–81%	<0.0001
Earache	121	506	–64%	<0.0001
Sore throat	76	204	–63%	0.05
Skin rash	247	693	–64%	<0.0001
Seizures	46	65	–29%	0.05
Discharge diagnosis, number:				
Injuries	2041	3526	–42%	<0.0001
Infectious diseases	1488	4722	–69%	<0.0001
Psychiatric diseases	107	161	–33%	0.01
Surgical diseases	46	60	–23%	0.02
Hospital admissions, number:				
Infectious diseases	69	88	–22%	<0.0001
Injuries	49	54	–9%	0.02
Surgical diseases	33	39	–15%	0.46
Neurological diseases	30	21	+30%	<0.0001
Psychiatric disorders	11	17	–35%	0.82
Ward patients were admitted to, number:				
Paediatric ward	69	91	–24%	0.16
Surgical ward	53	60	–12%	0.83
Neuro-psychiatric ward	37	36	+3%	0.60

(Continues)

TABLE 1 (Continued)

	Pandemic 2020–2021	Pre-pandemic 2019–2020	Percentage change	p value
Orthopaedic ward	30	38	–21%	0.52
Neonatal ward	6	26	–77%	0.001
Paediatric intensive care unit	5	7	–29%	0.67

TABLE 2 Comparisons between the main discharge diagnoses in the two winter periods from 1 October to 28 February

	Pandemic 2020–2021 n = 3682	Pre-pandemic 2019–2020 n = 8469	Percentage change	p value
Injuries, number:	2041	3526	–42%	<0.0001
Bone fracture	398	768	–48%	0.25
Wounds	287	342	–16%	<0.0001
Head trauma	164	246	–23%	0.001
Burns	32	41	–22%	0.04
Accidental intoxication	31	41	–24%	0.06
Infectious diseases, number:	1488	4722	–69%	<0.0001
Respiratory infections:	978	3481	–72%	<0.0001
Pneumonia	15	233	–94%	<0.0001
Otitis	194	784	–75%	<0.0001
Upper airway viral infection	441	1651	–63%	<0.0001
Viral wheezing	58	179	–68%	0.01
Laryngitis	49	133	–63%	0.10
Gastrointestinal infections	137	478	–71%	0.30
Sepsis/meningitis	2	3	–33%	0.35*
Dermatological infections	153	385	–60%	0.01
COVID-19	55	–	–	–
Psychiatric disorders, number:	107	161	–33%	0.01
Anxiety	41	66	–38%	0.21
Psychomotor agitation	33	33	0%	0.003
Depression	2	5	–60%	1.0*
Suicide attempt	2	4	–50%	1.0*
Substance and/or alcohol abuse	12	33	–64%	0.39

\*Fisher's exact test.

### 3.2 | Triage codes and main complains

The number of patients fell in all four triage categories. Non-urgent and minor urgency triage codes fell by 49% and 54% and urgent and emergency codes fell by lower rates, namely 48% and 38%. We saw a major decrease in the main complaints that are usually related to infectious diseases. There was an 81% reduction in patients presenting with coughs, a 71% fall in vomiting and a 64% decrease in earache. Similar reductions were observed in presentations with diarrhoea (59%) and respiratory distress and fever (both 58%).

### 3.3 | Admission status and ward of destination

Hospital admissions declined slightly from 2019–2020 to 2020–2021, by 8%, with a larger decrease of 29% in admissions to

paediatric intensive care unit. We saw a major decrease of 77% in the number of patients admitted to the neonatal ward. During the 2020–2021 study period, 11 (20%) of the 55 children who presented to the PED with COVID-19 symptoms and tested positive for SARS-CoV-2 were hospitalised. One of these needed to be admitted to the paediatric intensive care unit.

### 3.4 | Main discharge diagnoses

Table 2 shows the variations in the main discharge diagnoses during the pre-pandemic and pandemic periods. Overall injuries declined by 42%. Visits for bone fractures declined more than accesses for head trauma or burns, by 48% versus 23% and 22%. Infectious diseases fell by 69%. There were dramatic declines in respiratory infections and gastrointestinal infections, between the two periods, of

**TABLE 3** Distribution of the type of diagnosis according to the patients' ages in the two winters from the 1st of October to the 28th of February

Injuries	Pandemic 2020–2021 n = 2041	Pre-pandemic 2019–2020 n = 3526	p values
Patient age, n (%):			
Neonates	3 (0.2)	3 (0.1)	0.68*
Infant	66 (3.2)	74 (2.1)	0.01
Toddler	303 (14.8)	363 (10.3)	<0.0001
Pre-school	283 (13.9)	353 (10.0)	<0.0001
School child	881 (43.2)	1605 (45.5)	0.09
Adolescents	505 (24.7)	1128 (32.0)	<0.0001
Infectious diseases			
	Pandemic 2020–2021 n=1488	Pre-pandemic 2019–2020 n=4722	p values
Patient age, n (%):			
Neonates	19 (1.3)	74 (1.6)	0.42
Infant	192 (12.9)	673 (14.3)	0.19
Toddler	414 (27.8)	1265 (26.8)	0.43
Pre-school	253 (17.0)	1160 (24.6)	<0.0001
School child	356 (23.9)	1115 (23.6)	0.81
Adolescents	254 (17.1)	435 (9.2)	<0.0001
Psychiatric disorders			
	Pandemic 2020–2021 n = 107	Pre-pandemic 2019–2020 n = 161	p values
Patient age, n (%):			
Neonates	–	–	–
Infant	–	–	–
Toddler	–	–	–
Pre-school	–	–	–
School child	40 (37.4)	28 (17.4)	0.0002
Adolescents	65 (60.8)	125 (77.6)	0.003

\*Fisher exact test. See [Table 1](#) for definitions of age groups.

72% and 71%. Visits for psychiatric disorders declined by 33%, and there was a major 64% reduction in patients who presented with substance or alcohol abuse issues.

[Table 3](#) shows the distribution of diagnoses by age in the two periods. We experienced a statistically significant increase of injuries among toddlers and preschool children, but a statistically significant decrease among adolescents. Infectious diseases showed statistically significant decreases in preschool children and increases in adolescents. We were surprised to note that psychiatric disorders more than doubled in school children aged 6–12 years, from 17% to 37%, but fell from 78% to 61% in adolescents aged 13–17 years.

## 4 | DISCUSSION

The winter has always been considered the most challenging season in PEDs, with an increased number of visits, usually related to seasonal outbreaks of infectious diseases. Winter 2020–2021 was the first time that many countries put social distancing measures in place to halt the spread of the COVID-19 pandemic. Our Italian PED was no exception. The results of our study showed that these restrictions were associated with considerable

variations in the epidemiology of PED visits. When we compared October to February 2020–2021 with the same period in 2019–2020, we saw a statistically significant reduction of 52% in PED visits. However, this fall was not as high as the reductions reported by various Italian studies during previous, more stringent, lockdowns in 2020, when visits fell by up to 73%.<sup>1–4</sup> The difference between the winter 2020–2021 lockdown and the earlier Italian lockdowns was that we managed to maintain access to all outpatient and inpatient clinical activity at our hospital. The absolute number of cases who needed urgent medical attention declined during the 2020–2021 study period, as well as the number of paediatric patients who needed intensive care. This suggests that social distancing measures prevented some major injuries and severe infectious diseases, but did not lead to a measurable delay in patients receiving medical attention. This contrasted with previous reports relating to the stricter lockdown periods in 2020.<sup>7</sup>

As might be expected, we experienced a major decrease in visits and admissions related to transmissible infectious diseases, especially among preschool children aged 3–5. These findings were consistent with previous observations and reflect the more limited spread of common viral infection in winter 2020–2021. For

example, there was a lack of seasonal epidemic respiratory viruses, such as the syncytial respiratory virus and influenza viruses.<sup>8,9</sup> In Italy, preschool children were not required to wear face masks and their schools remained open. Our findings could contribute to the debate about how useful it is for children of certain ages to wear face masks.<sup>10</sup> Nevertheless, we should point out that there were still strict rules in preschools to limit contagious diseases. These included daily checks on the children's body temperature and any viral symptoms before they entered the school. The children were also divided into small groups for all activities, such as playing, eating and going to the toilet, and there was no contact between the different groups. All the adults had to wear face masks and the schools were kept well ventilated and sanitized.

Our results also showed a considerable decrease in urgent admissions to the neonatal ward. Most of the urgent admissions from the PED are neonates with viral infections, so we suggest that this finding was primarily related to the reduced spread of seasonal respiratory viruses.<sup>8,11</sup>

Only 11 of the 55 children who tested positive for SARS-CoV-2, after presenting with COVID-19 symptoms, were admitted and one of these was admitted to the paediatric intensive care unit. These data were in line with other data, including a systematic review, that reported that children only accounted for 1–5% of SARS-CoV-2 infections and generally had a milder disease, with lower rates of hospitalisation, intensive care admissions and death.<sup>12,13</sup>

Indoor sports activities were prohibited during winter 2020–2021 and this appeared to lead to a general decrease in the number of adolescents presenting with injuries. Adolescents accounted for a lower percentage of total injuries, while the percentage of head injuries and burns, which are more common in younger children and in the home, increased. Our data were in line with previous reports that showed a rise in traumatic domestic injuries during lockdown.<sup>14</sup>

Several studies have showed that isolation and restrictive measures, such as lockdowns, were associated with a negative impact on children's mental health, resulting in a growing incidence of anxiety, depression and a sense of uncertainty.<sup>15–17</sup> Our study noted reduced visits and admissions related to psychiatric symptoms, which suggested that the less restrictive measures in winter 2020–2021, compared with earlier phases of the pandemic, may have had a beneficial effect on mental health well-being. However, we noticed a relative increase of psychiatric symptoms in the younger children in our study. This data should be taken as a warning sign of the possible detrimental effect of restrictive measures, in general, on child mental health.<sup>18</sup> On the other hand, the reduction in psychiatric visits may also suggest reduced pressure on children by schools, parents and peers, including bullying.<sup>19</sup>

We observed a remarkable 64% reduction in visits related to substance and alcohol abuse. This could have been associated with specific measures, including the night curfew, the closure of bars, restaurants, nightclubs and prohibitions on gatherings. These data

were in line with the strict lockdown period, when these venues were also closed.<sup>20</sup>

## 4.1 | Strengths and limitations

Previous studies had already showed the effect of strict lockdown on PED access.<sup>1–6</sup> They have also shown the impact that lockdown measures and social restrictions have had on quality of life, schooling and social lives of children and adolescents.<sup>21</sup> The main strength of this study is that it adds to the existing knowledge on the impact of social distancing, by exploring how the number and type of PED visits, including diagnoses and outcomes, changed during a period of social distancing. This study also has several limitations. First, the retrospective and monocentric design of the study limits the generalisation of the results. Second, we cannot exclude that some medical records could have been coded incorrectly. Third, we cannot exclude that other factors, apart from social distancing measures, could have influenced the reduced number of PED visits. These could have included fears about catching the virus when visiting medical premises, natural variations in infections or different lifestyle approaches to health issues. In addition, we focused our investigation on a tertiary PED, which means that that we were not able to provide a comprehensive view of the combination of primary, secondary and tertiary care. Finally, we were not able to analyse the role that different socioeconomic patterns may have had on our findings.

## 5 | CONCLUSION

This study showed that social distancing measures to limit COVID-19 in winter 2020–2021 were associated with a large reduction in visits to an Italian tertiary PED, when we compared the data with the previous winter. Hospital admissions declined slightly from 2019–2020 to 2020–2021, by 8%, with a larger decrease of 29% in admissions to intensive care. Our study also provides a detailed analysis of triage codes and diagnoses covering six age groups from birth to 17 years of age.

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## CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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