

ORIGINAL PAPER

The impact of the COVID-19 pandemic on the operation of the Emergency Department at the University Hospital in Opole over 12 months: a retrospective study

Agnieszka Grobelczyk¹, Ada Lisowska^{2,3}, Marta Bokszczanin⁴, Nina Urantówka¹, Agata Chobot^{3,4}

¹Paediatrics' Students Scientific Association, School of Medicine, University of Opole, Poland

²Department of Emergency Medicine, University Clinical Hospital in Opole, Poland

³Institute of Medical Sciences, University of Opole, Poland

⁴Department of Paediatrics, University Clinical Hospital in Opole, Poland

ABSTRACT

Aim of the study: The SARS-CoV-2 pandemic profoundly impacted paediatric patient presentations at hospital emergency departments (EDs) worldwide. This study, conducted between 1 September 2019, and 31 August 2020, aimed to compare the admissions of paediatric patients before and after the outbreak of the pandemic (two 6-month periods) in a reference paediatric centre in the Opole voivodeship.

Material and methods: The research involved a retrospective analysis of anonymised data from Clininet – an electronic medical record system covering patient demographics, referral information, and diagnoses.

Results: The results indicated a significant decrease of approximately 70% in paediatric admissions to the ED after the outbreak of the pandemic. This decrease was accompanied by an increase in the proportion of patients admitted based on referrals from primary care providers or brought in by emergency medical teams. Before the outbreak of the pandemic, respiratory infections were the most common reason for paediatric ED visits. However, after the outbreak of the pandemic, diseases related to the digestive system became the predominant cause of admission.

Conclusions: These findings suggest significant shifts in healthcare utilisation patterns after the outbreak of the pandemic. The study emphasises the need for healthcare systems to adapt and improve their strategies for managing future health crises. By analysing the changes in patient presentations during this period, healthcare providers can enhance their preparedness and develop more effective responses to future public health emergencies.

KEY WORDS:

emergency department, paediatrics, pandemic, SARS-CoV-2.

INTRODUCTION

The SARS-CoV-2 virus, causing the acute infectious respiratory disease COVID-19, appeared in China in December 2019. Its rapid spread and drastic course caused

the World Health Organization to declare a pandemic on 11 March 2020. Governments of many countries worldwide, including Poland, introduced restrictions and bans on leaving home, travelling, and staying in crowds [1]. Social distancing, defined as closing schools and public

ADDRESS FOR CORRESPONDENCE:

Agnieszka Grobelczyk, Paediatrics' Students Scientific Association, School of Medicine, University of Opole, Medical Department, 48 Oleska St., 45-052 Opole, Poland, e-mail: agnieszka.grobelczyk@gmail.com

places, maintaining appropriate distance in public spaces, and wearing masks to reduce the spread of the virus, were implemented worldwide [2, 3]. On 4 March 2020, the first SARS-CoV-2 infection was confirmed in Poland. At the end of the month, restrictions were extended to closing nurseries and kindergartens.

The above actions resulted in worldwide restrictions on access to medical care, which often caused delays [4]. Thanks to extensive technology, teleconsultations were introduced quickly, limiting direct contact with a doctor to emergencies [5–8]. Despite this, a reduction in the number of visits to hospital emergency departments (EDs) was also observed. Perhaps people who were avoiding places where they could become infected with SARS-CoV-2 reported to a doctor only in situations of significant health deterioration [6, 8–10]. A reduction in patient flow was also observed around the world in paediatric emergency rooms and EDs, where reporting rates dropped by as much as 59–67% per day, especially during the first wave of the pandemic [5, 11–13]. Children with headaches, injuries, vomiting, and diarrhoea reported less frequently. However, it was noted that the reduction in consultations provided in paediatric emergency departments was accompanied by an increase in morbidity and mortality due to untreated diseases [7] and an increase in admissions to hospital wards [6, 8–10]. It was speculated that the reduced number of injuries in children during the first wave of the pandemic may have resulted from greater supervision by parents who worked remotely from home and reduced physical activity due to the lockdown [7, 13]. It was also suggested that parents and children went to the EDs less frequently because of biological, psychological, and social factors, and parents tried to treat the diseases themselves at home [14].

So far, no data have been published showing whether similar changes also occurred concerning services provided to children in emergency departments in Poland.

The study aimed to estimate the changes that occurred due to the outbreak of the COVID-19 pandemic in the scope of services provided to paediatric patients in the ED of a hospital, where the reference paediatric department and the only paediatric surgery department in the province are located.

MATERIAL AND METHODS

The analysis was based on a retrospective study of data from 1 September 2019 to 31 August 2020 of patients under 18 years of age who reported to the ED of the University Clinical Hospital in Opole. It is the only hospital accepting paediatric patients in the city and has the only reference paediatric and paediatric surgery departments in the voivodeship. Up to several thousand children annually used medical services in this hospital's ED in the years before the pandemic outbreak. Due to

the announcement of the pandemic on 11 March 2020, the observation period was divided into two 6-month periods: “before the outbreak of the pandemic” (T1) and from 1 March 2020 until “after the outbreak of the pandemic” (T2).

Anonymised data were obtained from the Clininet electronic medical records system (Compu Group Medical). This data included gender, age, place of residence, date and time of reporting to the ED, mode of reporting (independently or through emergency medical teams), whether or not there was a referral, duration of stay in the ED, admission to a hospital ward, length of hospitalisation, diagnosis (code according to the ICD-10 classification), and direction of discharge. The data were obtained with the consent of the Hospital Management. Due to the retrospective nature of the analysis of anonymised data, the study did not meet the criteria of a medical experiment (within the meaning of Article 21 of the Act of 5 December 1996, on the medical and dental professions [Journal of Laws 2019.537]). It did not require the opinion of the Bioethics Committee.

Due to the very large diversity of coded diagnoses, they were grouped according to the dominant component as follows: other endocrine diseases, excluding diabetes; acute gastroenteritis/infectious diarrhoea; eating disorders; gastrointestinal diseases; behavioural disorders; epilepsy and other neurological conditions/symptoms; ophthalmological diseases; ear, nose, and throat diseases; cardiac diseases; diseases of the urogenital system, including infections; diseases of the musculoskeletal system and connective tissue; upper respiratory tract infections and viral infections; congenital developmental defects; superficial injuries/presence of a foreign body; poisoning with drugs and toxic substances, contact with animal venom; medical examinations and observation for suspected diseases/other; sepsis and generalised inflammatory reactions; meningitis/encephalitis; infections and diseases of the lower respiratory tract/pneumonia and bronchitis; skin diseases and allergy diseases; oncological diseases; haematological disorders; and diabetes.

STATISTICAL ANALYSIS

The statistical analysis was performed in R version 4.2.3. Mean, standard deviation, median, and quartiles were calculated for quantitative variables. Each value's number and percentage of occurrences were calculated for qualitative variables. Comparison of the values of qualitative variables in groups was performed using the χ^2 test (with Yates correction for 2×2 tables) or Fisher's exact test where low expected numbers appeared. The comparison of the values of quantitative variables in 2 groups was performed using the Mann-Whitney test. The comparison of the values of quantitative variables in 3 or more groups was performed using the Kruskal-Wallis test. A significance level of 0.05 was adopted in the analysis.

RESULTS

During the analysed year, there were a total of 4317 paediatric admissions to the ED – 3289 patients before the outbreak of the pandemic and almost 3 times fewer (1028) after the outbreak of the pandemic, with no significant difference in terms of gender (1603 [48.7%] girls vs. 1686 [51.3%] boys in T1 and 515 [50.1%] girls and 513 [49.9%] boys in T2). The average age of children admitted to the ED was one year higher in the T2 period than in T1 (5.7 years vs. 4.7 years).

PATIENTS' PLACE OF RESIDENCE

Children from 13 Polish voivodeships visited the ED in the analysed period. In both T1 and T2, according to the location of the hospital, most patients were from the Opole voivodeship (3212 [97.7%] in T1 and 989 [96.2%] in T2). In T1, the second largest group were patients from outside of Poland (28; 0.9%), followed by patients from the voivodeships neighbouring Opole, i.e., Lower Silesia (19; 0.6%) and Silesia (15; 0.5%). However, in T2, equal groups of children from the Lower Silesian and Silesian voivodeships were admitted (10; 1.0% each) and far fewer foreign patients (4; 0.4%).

Concerning cities and counties, in T1, the majority of those hospitalised in the ED department (1794; 55.1%) were children from the city of Opole, while in T2, children from other towns and counties predominated (591; 57.2%). The percentage of paediatric patients from the Opole district outside the provincial capital admitted to the ED decreased in T2 (970; 29.8%) in comparison to T1 (338; 33.1%). In T2, despite the decrease in the absolute number of patients presenting to the ED, the percentage of children admitted from most districts of the Opole voivodeship increased.

PROCEDURE FOR REPORTING TO THE ED

On average, children brought to the ED by Emergency Medical Services (EMTs) accounted for less than a tenth of the cases (260 children; 6.0%). This percentage increased significantly in T2 (93; 9.0% vs. 167; 5.1%). A similar tendency concerned children admitted based on a referral from night medical assistance (NPL, Nocna Pomoc Lekarska) or primary health care (POZ, Podstawowa Opieka Zdrowotna) – slightly more frequently paediatric patients reported to the ED after an initial consultation and receiving a referral in T2 than in T1 (321 [31.2%] vs. 935 [28.4%]) (Figure 1). In both studied periods, reports of children without a referral from POZ/NPL predominated – T1: 2354 (71.6%) vs. T2: 707 (68.8%) (Figure 2). It should be noted that in general only about a third of patients received medical advice (NPL/POZ or contact with the EMTs) before reporting to the ED (EMT 260; 6.0%, NPL/POZ – 1254; 29.0%).

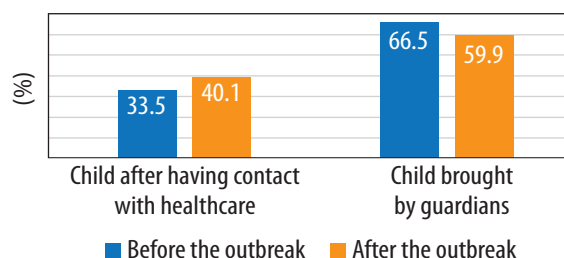


FIGURE 1. Did the child have contact with healthcare services before presenting to the Emergency Department?

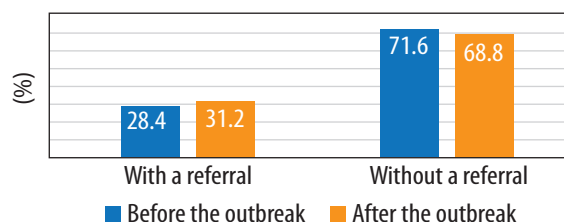


FIGURE 2. Presenting to the Emergency Department based on a referral from a primary care physician/out-of-hours doctor

REASON FOR REPORTING TO THE ED

Before the pandemic outbreak (T1), the most common groups of ailments with which patients reported to the ED were upper respiratory tract infections and viral infections – 979 (29.8%). This number decreased significantly in T2 (203; 19.7%), and the leading causes of visits to the hospital ED were gastrointestinal diseases (218; 21.2%), which were the second most common cause of admission to the ED in T1 (656; 20.0%). Infections and diseases of the lower respiratory tract, including pneumonia and bronchitis, were the third cause of ED visits in T1 (588; 17.9%) and T2 (100; 9.7%). Within T2, the percentage of admissions due to poisoning with drugs and toxic substances and contact with animal venom as well as due to behavioural disorders increased slightly (T1 vs. T2 – 41 [1.2%] vs. 48 [4.7%]; and 5 [0.2] vs. 7 [0.7%], respectively). A comparison of the percentage of children presenting to the ED according to different causes in T1 and T2 is presented in detail in Figure 3.

DURATION OF TREATMENT IN THE ED AND SUBSEQUENT HOSPITALISATION OR DISCHARGE HOME

The average length of stay of children in the ED in T2 increased slightly – by an average of about 5 minutes (108.5 vs. 113.7 minutes). However, the percentage of children admitted afterwards to one of the other hospital departments increased significantly (1059 [32.2%] vs. 437 [42.5%]). Most often, patients were hospitalised only in the paediatric ward, with a higher rate in T2 (1024 [31.13%] vs. 415 [40.37%]). The admissions to the paediatric surgery department also increased in T2, while

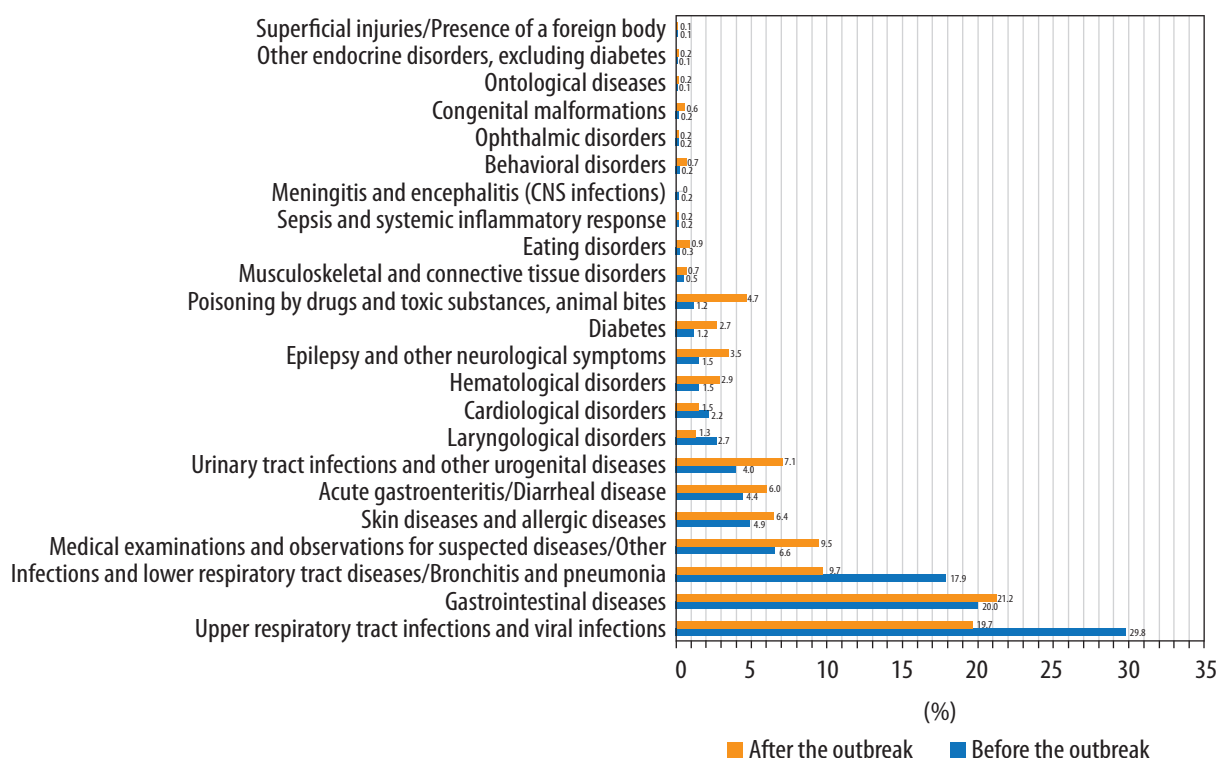


FIGURE 3. Reason for child's presentation to the Emergency Department

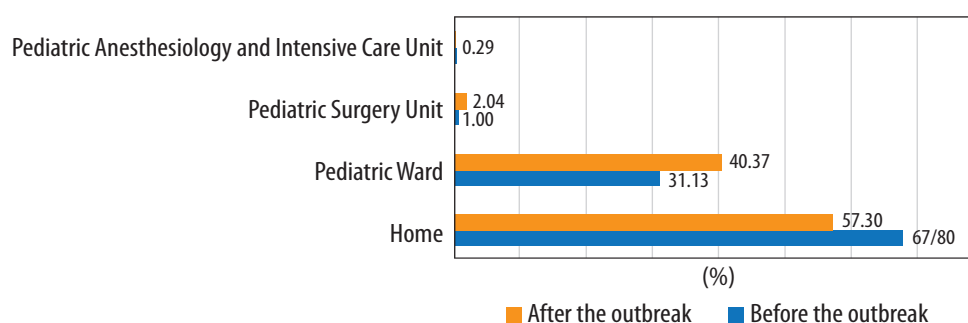


FIGURE 4. Directions of discharges from the hospital Emergency Department

admissions to the intensive care unit decreased (Figure 4). The average duration of these hospitalisations increased slightly in T2 (from 1.38 to 1.97 days). Additionally, in T2, children were transferred from the ED to other hospitals for further hospitalisation over 3 times more often (49 [4.8%] vs. 39 [1.2%]).

It should be noted that the percentage and number of children requiring treatment in several hospital departments of various specialities (outside the ED) was minimal (17 [0.4%]). Notably, almost 2/3 of all patients admitted to the ED (2819 [65.3%]) did not require admission to other hospital departments and were discharged home. This fact concerned 10% more children in T1 than in T2.

REASONS FOR HOSPITAL ADMISSION AFTER THE ED CONSULTATION

T1 and T2 differed significantly regarding the discharge diagnosis from the ED and the reasons for which

children were hospitalised in other hospital departments after the initial consultation in the ED.

In T1, the dominant diagnoses of children treated in the ED were:

- dyspepsia (K30) – 333 (10.1%),
- bacterial pneumonia (J15.9) – 260 (7.9%),
- acute bronchitis (J20.9) – 175 (7.5%),
- abdominal pain (R10.4) – 171 (5.2%),
- acute pharyngitis (J02.9) – 151 (4.6%),
- acute multiple upper respiratory tract infection (J06.8) – 147 (4.5%),
- acute laryngitis (J04.0) – 128 (3.9%),
- observing suspected diseases and conditions (Z03.9) – 121 (3.7%).

In turn, in T2, patients were most often treated in the ED for:

- abdominal pain (R10.4) – 71 (6.9%),
- dyspepsia (K30) – 67 (6.5%),
- observation of suspected diseases and conditions (Z03.9) – 57 (5.5%),

- diarrhoea and gastrointestinal inflammation of presumed infectious aetiology (A09) – 52 (5.1%),
- bacterial pneumonia (J15.9) – 52 (5.1%),
- urinary tract infections (N39.0) – 42 (4.1%),
- acute pharyngitis (J02.9) – 30 (2.9%),
- urticaria (L50.9) – 30 (2.9%).

In both observation periods, T1 and T2, the largest group of children transferred from the ED to another hospital department were diagnosed with bacterial pneumonia (162 [15.3%] vs. 42 [9.6%]). The second most common causes of hospitalization in both T1 and T2 were diarrhoea and gastroenteritis of presumably infectious aetiology (84 [7.9%] vs. 35 [8%]). Compared to T1, in T2 there were lower rates of patients admitted to other hospital departments due to acute bronchitis (58 [5.5%] vs. 7 [1.6%]), acute bronchiolitis caused by the RS virus (23 [2.2%] vs. [0%]), and dyspepsia (49 [4.6%] vs. 17 [3.9%]). On the other hand, the percentage of children transferred from the ED and treated in different hospital departments due to urinary tract infection (35 [3.3%] vs. 23 [5.3%]), insulin-dependent diabetes with ketoacidosis (13 [1.2%] vs. 13 [3.0%]) and central nervous system disorders (6 [0.6%] vs. 12 [2.7%]) increased in T2.

DISCUSSION

Experiences gained during the pandemic will shape strategies for dealing with health emergencies and crises. An analysis of 46 COVID-19-related manuscripts showed that the COVID-19 pandemic highlighted the healthcare organisation's limitations and the system's lack of adequate preparation for such events [16].

We report a nearly 70% reduction in the number of paediatric admissions to the hospital ED and an approximately 10% increase in subsequent admissions to the paediatric department. These results are consistent with trends observed in other studies [5, 8, 10, 15, 16]. ED visits decreased significantly across Europe, with the most significant decrease noted for airborne infections. However, an increase in the percentage of patients requiring hospital treatment was noticed [6, 8–10]. The levels to which ED visits decreased appear to be related to the introduction and expansion of preventive measures, changes in local health systems, hospital type, and the national incidence of SARS-CoV-2 but also may reflect the fear of infection and the increased availability of telemedicine [4–7]. Social distancing to combat COVID-19 and basic precautions also prevented the spread of infectious diseases. It can be speculated that the impact of COVID-19 on admissions and diseases treated in paediatric departments, especially acute cases, will continue to be felt in the future. As mentioned above, the observed decline in ED visits was likely multifactorial, including changed parental health-care-seeking behaviours. As a result, healthcare pathways were modified or newly introduced. In this context, it should be noted that we found that children spent

approximately 5 minutes longer in the ED (from registration to discharge) after the pandemic outbreak. This study did not assess the potential underlying causes of this finding. Still, they might be attributed to the more severe condition of the children seen in the ED in T2 or the procedures adopted after the outbreak of the pandemic.

The percentage of reports from outside the city of Opole increased by over 12%. One potential explanation is that the hospital was not renamed a “COVID hospital”. COVID units, predominantly for adults, were organised in other hospitals, including a temporary COVID hospital in Opole and a single paediatric COVID department in Kędzierzyn-Koźle. This may have contributed to parents preferring to travel to a more distant hospital, which they may have assumed “safer” regarding the infection and offering more specialised care (including paediatric surgery) than the regional hospitals.

There was a much lower rate of severe COVID-19 cases among the paediatric population than the adult population [9]. Unfortunately, children have not stopped suffering from periodic infections, acute exacerbations of chronic diseases such as cancer, endocrine disorders (e.g. diabetes) or surgical diseases [9]. In March 2020, immediately after the outbreak of the pandemic in Italy, there were 12 cases of delayed presentation to the hospital of children requiring urgent medical care due to a non-COVID-19 condition, of whom 4 died [7]. Notably, no deaths were recorded in these same hospitals during the same period in 2019, and the total annual number of childhood deaths in these hospitals ranged from zero to three [7]. We did not record similar cases during the analysed period. However, an increased rate of hospitalisations in the paediatric and paediatric surgery departments and slightly prolonged hospitalisation time were noted.

The number of patients admitted due to abdominal pain, gastroenteritis, and urinary tract disorders increased significantly. Similarly, a study by Marzec *et al.* [15] showed that abdominal pain was one of the main reasons for EMT calls. Parents of children with vomiting and diarrhoea may have reported to the ED more often than in the case of other infections because it is challenging to treat the accompanying dehydration in an outpatient setting effectively in case the symptoms persist. Moreover, social distancing, isolation, and the requirement to wear masks reduced the emission of infectious respiratory diseases, which additionally influenced the domination of other reasons for reporting, especially gastroenterological ones [15].

An interesting observation is the increase in the percentage of children admitted to the ED based on referral or brought by the EMTs. It seems that the pandemic outbreak may have significantly reduced ED admissions of children who were not in a state of immediate health risk. It also suggests that parents preferred to confirm the need to report to the hospital where they could poten-

tially be exposed to SARS-CoV-2. As indicated by a previous study, as a consequence of the pandemic-induced restrictions, the health of the entire family worsened, both physically and mentally, and their ability to establish proper social relationships deteriorated. Moreover, an increase in anxiety disorders among parents was reported (the vast majority of parents were concerned about their child's stay in the hospital and feared the possibility of contracting COVID-19), which may have influenced their decisions regarding contact with healthcare services in cases that did not require urgent medical intervention [17]. The study of Ponmani *et al.* [14] from United Kingdom also support this observation. They noted a 65–75% reduction in visits to paediatric departments in 2020 due to low-acuity diseases (upper respiratory tract inflammation, tonsillitis, otitis media, and gastrointestinal infection). Hospital visits for head and limb injuries dropped by 65% after the lockdown was announced. The number of hospitalisations due to respiratory diseases (bronchitis, pneumonia, hoarseness) decreased by even more (80%). It was also found that more than half of children hospitalised after the pandemic outbreak were without an accompanying adult [17].

Our study's results, showing a 69% decrease in reports to the paediatric ED after the outbreak of the pandemic, align with those from other European countries. At a university hospital in Madrid, at the beginning of the pandemic, 65.4% fewer children were admitted to the paediatric ED than in the same period in 2019. The most common complaints were fever (26.5%), respiratory symptoms (16.1%), and injuries (15.2%) [4]. A study from Greece reported that most frequently, children were treated at the ED before and during the COVID-19 pandemic because of fever and/or respiratory symptoms (62.8% and 65.1% of all visits to the ED, respectively) and gastrointestinal symptoms (10.60% and 10.30%, respectively) [8]. We described a significant decline in reports of children with respiratory infections (47.7% vs. 29.4%), which still accounted for most ED reports, consistent with the trend observed throughout Europe. Similarly to the study by Kostopoulou *et al.* [8], and unlike the study by Ponmani *et al.* [14], the second most common cause of reports in our hospital was digestive system disorders, which were more common than before the pandemic.

To measure the impact of COVID-19 on ED visits in the United States, the Centers for Disease Control and Prevention compared the number of ED visits over 4 weeks after the outbreak of the pandemic (from 29 March to 25 April, 2020 – the early pandemic period) with a comparable period in 2019 [5]. This analysis showed that the number of visits decreased by 42%, with the most significant decline occurring among others in people aged ≤ 14 years. Although in the later period of the pandemic (December 2020 – January 2021), the number of visits to paediatric EDs was globally only 17% lower compared to the pre-pandemic period, the largest decreases

in the number of reports still concerned children under 11 years of age [12]. Other studies, including those conducted in Italy, Spain, and Greece, or by the European Research Program in Emergency Paediatrics and the research networks of Paediatric Emergency Centres in Great Britain and Ireland, have shown a similar trend [11].

Conducting an analysis based on admissions to the only reference paediatric centre in the voivodeship with the largest ED in the Opole region, as well as taking into account 2 long, 6-month observation periods, are the strengths of this work. The limitations include mainly the single-centre nature of the study. Attention should also be paid to the differences between the organisation of paediatric reference centres and their number in other regions of Poland and healthcare systems between countries. Therefore, the collected data and results cannot be easily generalised. Limitations also encompass the inclusion in the analysis of diagnoses based only on ICD-10 codes without comparing them with descriptive diagnoses.

CONCLUSIONS

After the outbreak of the SARS-CoV-2 pandemic, the number of paediatric patients reported to the ED of the University Clinical Hospital in Opole, a hospital with a reference paediatric department for the province and the only paediatric surgery department and paediatric intensive care unit, decreased by more than two-thirds.

Medical facilities and relevant institutions should use experiences from the pandemic period and data analysis from this period to prepare and improve action plans for potential future health crises.

DISCLOSURES

1. Institutional review board statement: Not applicable.
2. Assistance with the article: None.
3. Financial support and sponsorship: None.
4. Conflicts of interest: None.

REFERENCES

1. Arshad Ali S, Baloch M, Ahmed N, et al. The outbreak of Coronavirus Disease 2019 (COVID-19) – an emerging global health threat. *J Infect Public Health* 2020; 13: 644–646.
2. Jackson C, Mangtani P, Hawker J, et al. The effects of school closures on influenza outbreaks and pandemics: systematic review of simulation studies. *PLoS One* 2014; 9: e97297. DOI: 10.1371/journal.pone.0097297.
3. Cauchemez S, Ferguson NM, Wachtel C, et al. Closure of schools during an influenza pandemic. *Lancet Infect Dis* 2009; 9: 473–481.
4. Molina Gutiérrez MÁ, Ruiz Domínguez JA, Bueno Barriocanal M, et al. Impact of the COVID-19 pandemic on emergency department: Early findings from a hospital in Madrid. *An Pediatr (Engl Ed)* 2020; 93: 313–322.
5. Hartnett KP, Kite-Powell A, DeVies J, et al.; National Syndromic Surveillance Program Community of Practice. Impact of the COVID-19

- pandemic on emergency department visits – United States, January 1, 2019–May 30, 2020. *MMWR Morb Mortal Wkly Rep* 2020; 69: 699-704.
6. Cheng CW, Huang YB, Chao HY, et al. Impact of the COVID-19 pandemic on pediatric emergency medicine: a systematic review. *Medicina (Kaunas)* 2022; 58: 1112. DOI: 10.3390/medicina58081112.
 7. Lazzerini M, Barbi E, Apicella A, et al. Delayed access or provision of care in Italy resulting from fear of COVID-19. *Lancet Child Adolesc Health* 2020; 4: e10-e11. DOI: 10.1016/S2352-4642(20)30108-5.
 8. Kostopoulou E, Gkentzi D, Papasotiriou M, et al. The impact of COVID-19 on paediatric emergency department visits. A one-year retrospective study. *Pediatr Res* 2022; 91: 1257-1262.
 9. Nijman RG, Honeyford K, Farrugia R, et al. in association with the REPEM network (Research in European Pediatric Emergency Medicine) as part of the EPISODES study group. Presentations of children to emergency departments across Europe and the COVID-19 pandemic: a multinational observational study. *PLoS Med* 2022; 19: e1003974. DOI: 10.1371/journal.pmed.1003974.
 10. Hu N, Nassar N, Shrapnel J, et al. The impact of the COVID-19 pandemic on paediatric health service use within one year after the first pandemic outbreak in New South Wales Australia – a time series analysis. *Lancet Reg Health West Pac* 2022; 19: 100311. DOI: 10.1016/j.lanwpc.2021.100311.
 11. Walker DM, Tolentino VR. COVID-19: the effects on the practice of pediatric emergency medicine. *Pediatr Emerg Med Pract* 2020; 17 (Suppl 6-3): 1-15.
 12. Adjemian J, Hartnett KP, Kite-Powell A, et al. Update: COVID-19 pandemic-associated changes in emergency department visits – United States, December 2020–January 2021. *MMWR Morb Mortal Wkly Rep* 2021; 70: 552-556.
 13. Pines JM, Zocchi MS, Black BS, et al.; US Acute Care Solutions Research Group. Characterizing pediatric emergency department visits during the COVID-19 pandemic. *Am J Emerg Med* 2021; 41: 201-204.
 14. Ponmani C, Wickramarachchi C, Mathers L, et al. 612 Paediatric ED attendances viewed through the Covid lens – perspective from an emergency department. *Arch Dis Child* 2021; 106: A59.
 15. Marzec L, Skotnicka-Klonowicz G, Sikora JP. Impact of Covid-19 pandemic in Poland on emergency medical teams interventions for patients reporting pain. *Med Og Nauk Zdr* 2024; 30: 227-231.
 16. Mrozek-Gąsiorowska MA. Assessment of the impact of the COVID-19 pandemic on the level of health care services in Poland – a review. *Med Og Nauk Zdr* 2023; 29: 251-261.
 17. Płoszaj KM, Kochman D. Impact of the Coronavirus (COVID-19) pandemic on the quality of life of the family and the child. *Innovations in Nursing and Health Sciences* 2021; 6: 59-78.