Volume: 20 Issue: 2 Year: 2025 Original Article e-ISSN: 1305-7707

The COVID-19 Pandemic's Impact on General Pediatric Ward Admissions: A Single-Centre Study

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Article Info

Received: May 25, 2024
Accepted: December 01, 2024
Published: May 27, 2025

Keywords:
Coronavirus infection, paediatric, hospitalization, general wards, pandemic.

ABSTRACT

Objective: A decline in healthcare utilisation and hospital admissions resulted from the COVID-19 pandemic, severely affecting many aspects of life. In this study, we sought to evaluate the pandemic impact on general paediatric admissions by comparing the one-year pre-pandemic period.

Methods: From the hospital records, all paediatric admissions from the beginning of March 2020 to the end of February 2021 and the corresponding period in 2019–2020 were included in this descriptive study.

Results: A total of 4,179 hospitalisations met the study's inclusion criteria; 2,778 occurred before the pandemic, and 1,401 occurred during the pandemic. The total paediatric hospitalisations decreased by 49.6% during the pandemic compared to before. Asthma (p-value <0.000), acute bronchiolitis (p-value <0.01), upper respiratory tract infections (p-value <0.000), and delivery-related disorders (p-value <0.01) all showed substantial significant decreases during the pandemic period compared to the pre-pandemic era.

Conclusion: The decline in the overall hospitalisation rate reflected the fear of contracting COVID-19 in an unsafe hospital environment. Concurrently, the incidence of communicable diseases fell due to pandemic-related lockdowns, hand hygiene issues, and school closures. While social distancing is highly recommended to protect children's health, public health officials must keep reminding parents not to defer necessary care since paediatric services remain accessible and unaffected during these difficult times.

To cite this article:

Aleed, A., Alsalamah, A., Alharbi, A. O., Alrashedi, A., Al-Nafeeseah, A., Al-Wutayd, O., & Al-Batanony, M. A. (2025). The COVID-19 Pandemic's Impact on General Pediatric Ward Admissions: A Single-Centre Study. *Journal of Pediatric Neurology, 20*(2), 109-115.

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Introduction

The virus rapidly spread worldwide after the first report of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in China in December 2019,[1]. The World Health Organization (WHO) declared COVID-19 a pandemic on 11th March 2020.[2] Many studies concerning COVID-19's impact on paediatric patients have concluded that most infected children showed no or minor symptoms.[3,4]

The actions taken at the start of the COVID-19 pandemic, including the use of masks, social distancing, remote school learning, working from home, suspending public or crowded gatherings and closing public spaces, not only reduced the virus's spread but also influenced the prevalence of numerous infectious diseases.[5,6] This impact has been documented in comparable circumstances.[7] Given that infectious diseases account for 28% of diagnoses at the paediatric emergency departments (EDs), [eight] of these effects might be particularly noticeable in paediatrics. Reduced paediatric admissions have been observed at several global centres, including those in Italy,[9,10] the United Kingdom,[11] Ireland[12], the United States[13] and Iraq.[14]

Although children have been substantially spared from severe SARS-CoV-2 infections necessitating hospitalisation,[15,16] whether protective strategies are linked to paediatric inpatient treatment for illnesses caused by other respiratory viruses remains uncertain.

In this study, we aimed to compare different rates of paediatric admission diseases at the general paediatric ward of a secondary healthcare hospital during the first year of the COVID-19 pandemic with the corresponding pre-pandemic year.

Materials and Methods

This descriptive study was conducted at a single central hospital, King Saud Hospital in Unaizah City, Saudi Arabia. The hospital offers paediatric healthcare services. All paediatric ward admissions were included from 1 March 2020 to 28 February 2021. Additionally, paediatric hospitalizations during the corresponding period of the previous year, 2019–2020, were included. Data were extracted from the hospital's electronic database. The admitted patients' diagnoses were allocated into subgroups for upper respiratory tract infections (URTs), lower respiratory tract infections (LRTs), gastrointestinal-related diseases (GIs), cardiovascular diseases (CVSs) and others. All pandemic and pre-pandemic paediatric hospitalisations within the specified period were included except for those of patients older than 18 years old, patients with COVID-19, patients admitted to the neonatal intensive care unit (NICU) and patients admitted to the paediatric intensive care unit (PICU).

Ethical approval from the Regional Research Ethics Committee of Qassim Region (No. 102763-1442 on 2 September 2020) was obtained. All data were kept confidential and used only for research purposes.

The data was stored and analysed using Microsoft Excel 2016. More statistical analysis was performed using the online open*EPI* Program software. Categorical data were presented as frequencies and percentages (*n* and *%*).

Results

A total of 4,179 paediatric admissions during the study period were identified. Two-thirds of these hospitalisations occurred before the pandemic (*n* = 2,778, 66.5%), while the remaining occurred during the pandemic (*n* = 1,401, 33.5%).

Table 1. All hospitalised patients distributed by diagnosis (*N* = 4,179)

Disease	Total *n* (%)
Upper respiratory tract (URT)	537 (12.8)
Lower respiratory tract (LRT)	343 (8.2)
Acute bronchiolitis (AB)	139 (3.3)
Haematology	98 (2.3)
Urinary	92 (2.2)
Musculoskeletal (MSI)	55 (1.3)
Gastro-intestinal (GIT)	658 (15.8)
Asthma	243 (5.8)
Labour	381 (9.1)
Congenital	195 (4.7)
Delivery-related	143 (3.4)
Developmental	95 (2.3)
Neurological (CNS)	351 (8.4)
Cardiovascular (CVS)	41 (1)
Diabetes mellites (DM)	176 (4.2)
Premature	313 (7.5)
Others	319 (7.6)
Total	**4,179 (100)**

NB: others like intoxications, electrolyte imbalance and other miscellaneous infections.

Additionally, the overall admissions due to URTs totalled 537 (12.8%), versus 343 (8.2%) for LRTs, 658 (15.8%) for GIs, 243 (5.8%) for asthma, 139 (3.3%) for acute bronchiolitis, 92 (2.2%) for urinary-tract-related diseases, 351 for nervous-system-related diseases (8.4%), 41 for CVS-related diseases (1%), 55 for musculoskeletal-related diseases (1.3%), 143 (3.4%) for delivery-related conditions (e.g. premature rupture of membrane and birth trauma), 95 (2.3%) for developmental diseases (e.g. slow fetal growth, and small for gestational age), 195 (4.7%) for congenital anomalies, 313 (7.5%) for prematurity, 176 (4.2%) for diabetes mellitus, 98 (2.3%) for haematology-related-diseases, 381 (9.1%) for born in the hospital and 319 (7.6%) for others (e.g. intoxications, electrolyte imbalance and other miscellaneous infections) (**Table 1**).

Table 2. Different diagnoses' distribution by hospitalisation period

Disease	Pre-pandemic n (%)	Pandemic n (%)	*P-value*
Upper respiratory tract (URT)	434 (15.6)	103 (7.4)	**0.000**
Lower respiratory tract (LRT)	236 (8.5)	107 (7.6)	0.34
Acute bronchiolitis (AB)	106 (3.8)	33 (2.4)	**0.01**
Haematology	64 (2.3)	34 (2.4)	0.80
Urinary	55 (2)	37 (2.6)	0.16
Musculoskeletal (MSI)	40 (1.4)	15 (1.1)	0.32
Gastro-intestinal (GIT)	437 (15.7)	221 (15.8)	0.97
Asthma	192 (6.9)	51 (3.6)	**0.000**
Labour	240 (8.6)	141 (10.1)	0.13
Congenital	111 (4)	84 (6)	**0.003**
Delivery-related	109 (3.9)	34 (2.4)	**0.01**
Developmental	69 (2.5)	26 (1.9)	0.19
Neurological (CNS)	238 (8.6)	113 (8.1)	0.58
Cardiovascular (CVS)	16 (0.6)	25 (1.8)	**0.000**
Diabetes mellites (DM)	97 (3.5)	79 (5.6)	**0.001**
Premature	187 (6.7)	126 (9)	**0.008**
Others	147 (5.3)	172 (12.3)	**0.000**
Total	**2778 (100)**	**1401 (100)**	

During the pandemic period, from 1 March 2020 to 28 February 2021, a dramatic reduction in the hospital admission rate was observed compared to the corresponding pre-pandemic period in 2019–2020. The hospitalisations fell from 2,778 patients to 1,401, a decline of 49.6%. Hospitalisation rate decreased during the pandemic relative to the pre-pandemic period for URTs, acute bronchiolitis, asthma and delivery-related conditions (**Table 2**).

Discussion

In the current study, we investigated the impact of the COVID-19 pandemic on the rate of paediatric hospital admissions at King Saud Hospital, Unaizah City, Qassim region. Children have been reported to develop modest COVID-19 symptoms, including fever, cough, sore throat and sneezing.[3,17] Additionally, emerging research indicates that children's historical exposure to coronavirus strains other than COVID-19 may offer some cross-protection against COVID-19.[18,19] The current study revealed a noticeable decrease in the total paediatric hospitalisations during the pandemic compared to before the pandemic. Hospital admissions declined by 49.6% during the studied pandemic period. Concerns about such reported declines in paediatric hospitalisations are mounting even though the paediatric population does not appear to have been as negatively affected by COVID-19 as the adult population.[3]

The current study's finding of a reduction in admission rate is consistent with the findings of other studies. A similar admission rate reduction of 44.1% was observed in a recent Turkish study.[20] In Malta, a 57.7% decrease in paediatric hospitalisation was reported during the COVID-19 pandemic's first year.[21] Additionally, a 76% decrease in paediatric emergency visits post-pandemic compared to pre-pandemic was reported in Italy.[9] Many studies revealed that, during COVID-19-related lockdowns, absolute admission rates declined by 19–73%.[10,22,23] Similar observations were reported in Ireland,[12] the United States,[13] the United Kingdom,[11] Italy[23] and India.[24] Although paediatric admissions have fallen over the last decade, their documented acute decline during COVID-19's initial wave was more significant than the previous year-over-year decline. The frequency of index admissions was reduced by 25%, 21.3% and 12%, respectively, in the United States[25,26] and Canada.[27]

In the current study, the most notifiable significant declines in admission rates during the studied pandemic year compared to the pre-COVID-19 year were observed for acute bronchiolitis, URTs and asthma. Generally, the proportion of children

admitted due to respiratory illnesses was lower than that of children admitted due to other paediatric disorders. A finding that has also been observed in many other countries, such as the United States, is that asthma and bronchiolitis were associated with significantly fewer median hospitalisations during the initial COVID-19 outbreak.[6] Similarly, paediatric asthma, pneumonia and bronchiolitis presentations to the Emergency Department (ED) were markedly decreased throughout the lockdown period in India.[24] In Australia, the most decreased admissions rates were associated with croup (91%), bronchiolitis (85%), pneumonia (76%) and cellulitis (44%).[28] A recent Turkish study found that overall respiratory disease admissions significantly declined from 40.5% to 18.6%.[20] The same study revealed that bronchiolitis hospitalisations almost entirely ceased during the pandemic; they decreased from 17.4% in the pre-pandemic period to 0.3% during the studied pandemic year.[20]

In the current study, paediatric attendance due to urinary tract-related diseases or infections did not seem to have differed between the pre-and post-pandemic periods. This finding aligns with the results of other research.[6,29,30] Moreover, in the current study, admissions for musculoskeletal-related conditions were associated with a relatively unchanged rate, and similar findings have been obtained in other studies.[31,32] In the current study, no difference in gastrointestinal-related hospitalisation rates was observed between COVID-19 surges and the corresponding pre-pandemic year. A similar result was also reported in an American study[6].

In our study, though the number of hospitalized patients due to congenital anomalies, diabetes mellitus, or prematurity decreased during the pandemic year, the proportion of these diagnoses among all admissions was significantly increased. This finding can be explained by the fact that hospitalisations for respiratory tract infections observably decreased during the pandemic's first year, leading to a relative increase in the rate of patients admitted for those other diagnoses.

Multifactorial elements could explain the reduction in paediatric presentations and admissions during the pandemic. Initially, a positive consequence of lockdowns and the closure of nurseries and schools was an impressive reduction in child-to-child contact and, consequently, in communicable infections.[9,29,30,33] These infections account for a significant amount of paediatric medical visits. This theory was supported by the current study, which showed that transmissible diseases and diagnoses associated with infections were associated with the most significant observed decrease in admission rates. If this reduction could not be attributed to this effect, a similar size reduction would be anticipated in the other categories.

A secondary reason might have been the high demand that the pandemic exerted on the healthcare system and the fact that COVID-19 patients received most of the clinical treatments provided in hospitals[29]. Despite children's worsening symptoms, parents' fear of their children contracting COVID-19 and their desire to avoid adding to the already heavy burden on the healthcare system may have led them to refrain from bringing their children to healthcare settings.[10,20] Thus, parents may have postponed necessary care for their children.[6] The same trend of fear or anxiety has been revealed among adults.[12,14] However, the existing data have shown that the danger of serious untreated infections in children substantially outweighs their risk of contracting severe COVID-19.[4,16,34] In this context, the literature has revealed a correlation between a higher disease acuity and the general causes of ED visits or admissions.[35,36]

Virtual clinics and telemedicine[37] may also seem to have decreased hospitalisations; on the other hand, they may have increased the risk of misdiagnoses or overlooking severe conditions. Furthermore, reports have examined delayed referrals and their effects.[10,38] Additionally, a substantial, significant improvement in air quality during lockdown due to social distancing, mask use, hand hygiene, curfews and restricted car travel may have contributed to better infection control.[33,39]

Furthermore, the implemented preventive measures, including masks, hand hygiene, social distancing, and lockdowns during the pandemic, besides parents' worry and concern regarding their children being exposed to illnesses in the hospital environments, can be listed as elements that lead to reduced pediatric hospitalizations.[20]

The limitation of the current study was its single-centric design, which indicates that its findings can only be generalised to similar institutions. Furthermore, rather than focusing on patients, data analysis in this study was done on hospitalization diagnoses. Additionally, information about hospital lengths of stays, disease acuity, and ICU admissions

would have added more context, but such information was inaccessible. Another potential limitation is studying a single year during the pandemic in Saudi Arabia; hence, the accurate long-term effects of the COVID-19 outbreak may not be fairly represented. Moreover, as no patients were investigated to detect viral/bacterial agents and it was not documented, we could not pinpoint causative viral/bacterial agents for urinary tract infections, acute gastroenteritis, or respiratory tract infections. The study's final limitation is that its primary diagnostic codes were selected by coders and providers with selection bias, which might have led to the over- or under-representation of certain diagnosis groups in the data. Accordingly, however, this bias was probably consistent across the two studied years, which would have reduced the impact of this limitation.

Conclusion

The COVID-19 pandemic negatively affected paediatric hospital admission trends. This study highlighted an intense decline in the hospitalisation rates for respiratory tract infections among paediatric patients during the pandemic's first year compared to the pre-pandemic year.

Declarations

Acknowledgments

The authors wish to thank the data officers who retrieved the data from the hospital database. The Researchers would like to thank the Deanship of Graduate Studies and Scientific Research at Qassim University for financial support (QU-APC-2024-9/1).

Author contributions

A. Al-Eed, A. Alnafeesah and O. Al-Wutayd : Conceptualization, data curation and revising the first draft of the manuscript. A. Alsalama and A Alharbi: Conceptualization, data curation. A. Alrashidi, A. Alnafeesah and O. Al-Wutayd: writing the first draft of the manuscript. M. Al-Batanony: Conceptualization, data curation, Formal analysis. All authors approved the final draft of the manuscript.

Conflict of interest

The authors have no conflict of interest to declare.

Funding

The authors declared that this study has received no financial support.

Consent to participate

Informed consent was waived by the Regional Research Ethics Committee in Qassim region because all data was collected anonymously.

Data availability

Data is available from the corresponding author upon reasonable request.

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