



Original Article

Non-COVID-19 reasons for hospitalisation among children during the COVID-19 pandemic compared with the pre-pandemic period – A prospective population-based study from Barbados

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Received: 06 April 2023
Accepted: 16 July 2023
Epub Ahead of Print: 15 September 2023
Published: 25 September 2023

DOI
10.25259/KPJ_24_2023

Quick Response Code:



ABSTRACT

Objectives: Numerous studies from around the world have documented disruption as well as a decrease in child health services. In this study, we look at the impact of the pandemic from a different perspective. We compare the spectrum of non-COVID-19 illnesses which necessitated hospitalisation among children during this pandemic and the pre-pandemic times.

Material and Methods: This is a population-based prospective clinical audit of children (Age <16 years) admitted for COVID-19-unrelated illnesses during the ongoing COVID-19 pandemic. Data on admissions are routinely collected for clinical audits. The study period was extended from April 2020 to March 2022. The primary measured outcome was the primary discharge diagnosis. Other outcome measures were frequency of admissions, frequency of intensive care and number of deaths. The measured outcome during the pandemic was compared with the corresponding period in the pre-pandemic period.

Results: There were 1282 non-COVID medical admissions from children (<16 years) during the COVID-19 pandemic compared to the 2168 admissions during the corresponding months in the immediate pre-pandemic period. This corresponds to a decline of 40.7% (95% confidence interval = 8.1%, 42.9%). Mean monthly admissions from acute respiratory illnesses (acute exacerbation of asthma phenotypes and respiratory tract infections) and acute gastroenteritis was 5.4 (± 1.8) and 2.6 (± 0.7) during the pandemic months compared to 35.1 (± 7.2) and 5.3 (± 0.8) during the corresponding pre-pandemic months, respectively. Both these differences were statically significant ($P < 0.0001$).

Conclusion: There was a significant decline in the admissions from medical illnesses among children and this was almost entirely due to a sharp and significant decline in admissions from acute respiratory illnesses and acute gastroenteritis.

Keywords: COVID-19 pandemic, Paediatric hospitalization, Hospital discharge diagnosis, Frequency of hospitalization

INTRODUCTION

The ongoing COVID-19 pandemic has now affected almost the entire world. Many studies from around the world have reported major changes in the utilisation of healthcare services due to such measures as lockdowns and stay-at-home orders. A report from a systematic review has shown

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that healthcare utilisation decreased by about a third during the pandemic, with considerable variation and with greater reductions among people with less severe illnesses.^[1] Another global survey reported that people have faced substantial barriers in accessing healthcare services during the pandemic in terms of closure of healthcare centres (10%), long queues at healthcare centres resulting in not being assessed or treated (12%) and a shortage of required medication at health-care centres and pharmacies (15%).^[2]

Barbados, one of the Island states in the Caribbean, is a popular tourist destination. It has an estimated population of 286,100 (2014 estimated), including 58,926 children under the age of 16. The COVID-19 pandemic reached this country relatively late, with its first few cases reported in the 3rd week of March 2020. The government of Barbados, fearing a rapid spread of COVID-19 due to the high volume of tourism-related international travel from Europe and North America, enforced a strict lockdown in the 4th week of March 2020. Borders were closed to all international travel. All daycare facilities for children, schools and colleges were closed. Non-essential commercial facilities were shut and a strict 24-h curfew was enforced. The lockdown was lifted by mid-2020 with the easing of some of the restrictions. Although, there has been no further lockdown after the initial lockdown in April 2020 which lasted for 3 months, a number of restrictions have been in place including the closure of all schools, social distancing and wearing of masks in all public places for the entire 2000 and 2001.^[3,4] Throughout the pandemic, the routine healthcare services in Barbados remained open to the public for routine preventative and curative healthcare with all necessary World Health Organisation recommended precautions for this pandemic in place.

Numerous studies from around the world have documented disruption as well as a decrease in child health services. In this study, we look at the impact of the pandemic from a different perspective. We compare the spectrum of non-COVID-19 illnesses which necessitated hospitalisation among children during this pandemic and the pre-pandemic times. Based on the findings from our small study^[5] at the beginning of this pandemic, we hypothesised that the nature of illnesses seen among children during this COVID-19 pandemic, with all its restrictions and preventative measures, have changed significantly.

MATERIAL AND METHODS

This is a population-based prospective clinical audit of children (Age <16 years) admitted for COVID-19-unrelated illnesses to the Queen Elizabeth Hospital (QEH) during the ongoing COVID-19 pandemic. This study forms part of an ongoing clinical audit of hospitalisation among children for respiratory illnesses being undertaken since 2017. The QEH is the only tertiary care hospital in Barbados where children

are admitted for any medical condition that necessitates in-patient care. The paediatrics division at the QEH has a general paediatric unit, adolescent unit, neonatal unit for neonates who require admission after discharge from their post-natal care after delivery, paediatric intensive care unit and children admitted primarily for medical conditions in all these units were included for this study.

All COVID-19-unrelated paediatric medical admissions (PMA's) at the QEH were included in the audit. Paediatrics at QEH also has a dedicated neonatal care unit for care (including intensive care) of babies who are sick after their delivery at the QEH, where over 90% of all deliveries in Barbados take place. Admissions to the neonatal intensive care unit were excluded from this audit. Furthermore, children admitted primarily for surgical conditions were excluded from this audit. This audit covers the period extending from April 2020 to January 2022. The audit data from April 2018 to March 2020 the corresponding months in the pre-pandemic period were used as historical control.

Paediatric admission data are routinely tracked using the admission register to collect data on the number of admissions, source (where the patient came from) of admission and age and gender of the admitted children for the departmental audit. Inpatient records were used to extract the data on discharge outcomes in terms of death or discharge, the primary diagnosis at discharge or death and children who required intensive care.

For the purpose of this study, data were extracted for the period extending from April 2018 to January 2022. The International Classification of Diseases IX revision was used to assign the discharge diagnosis based on the clinical presentations, course of the illness and the results from the laboratory investigations. Each patient was treated at the discretion of the treating physicians on the team headed by a consultant paediatrician.

The primary measured outcome was the primary discharge diagnosis. Other outcome measures were the frequency of admissions for COVID-19-unrelated conditions; the number of PMA's requiring intensive care – those admitted to the paediatric intensive care and the number of deaths from medical illnesses. The measured outcome during the pandemic was compared with the corresponding period in the pre-pandemic period.

All data were entered into a Microsoft Access database on the day of data collection by a research assistant who was given 1-day training in the data entry technique. The database itself was also anonymised with an assigned enrolment number as the only identifier and was password protected. All data pertaining to the enrolment itself were stored in a password-secured Microsoft Access database where the child was identified by their initials followed by the date of birth

and only the principal investigator had access to this data set. Microsoft Excel was used for basic data analysis and the generation of tables and graphs. Statistical analyses were performed using the Vassar Statistical package. Categorical variables were reported as frequency counts and proportions with 95% Confidence Interval (CI) (continuity correction). Any possible differences in the mean frequency of admissions during the pre-pandemic period (2018–19 and 2019–20) and the pandemic period (2020–21 and 2021–22) were analysed using one-way analysis of variance (ANOVA) for four independent samples. The difference in the frequency of admissions from major discharge diagnosis during the pandemic and pre-pandemic period was analysed using *t*-test for independent samples assuming unequal sample variance. *P*-value was reported for two-tailed analysis.

Ethics statement

This study report forms part of an ongoing audit of paediatric admission and has ethical approval from the Institutional Review Board at the QEH (REF 2018-01-17).

RESULTS

There were 1282 non-COVID medical admissions from children (<16 years) to the QEH during the COVID-19 pandemic (April 2020 through January 2022) compared to the 2168 admissions during the corresponding months in the immediate pre-pandemic period. This corresponds to a decline of 40.7% (95% CI = 8.1%, 42.9%). The demographic profile of admitted children is shown in [Table 1]. There was a significant ($P < 0.0001$) decline in the proportion of children in the age group 5 years or less that were admitted during the pandemic compared to the corresponding pre-pandemic period. In addition, a significantly higher proportion of female children were admitted during the pandemic compared to the corresponding pre-pandemic period.

The frequency of non-COVID medical admissions during the months of the pandemic period compared to those

of the corresponding pre-pandemic period is shown in [Figure 1]. The mean monthly admissions decreased from 90 (± 10.1) during the pre-pandemic months to 56 (± 5.7) during pandemic months ($P < 0.0001$). The decline in the frequency of admissions was consistently lower throughout the pandemic months. One-way ANOVA analysis of visit frequency showed significantly reduced visits during the pandemic when compared with the corresponding pre-pandemic period ($F = 12.21$, $P < 0.0001$). Tukey HSD test showed HSD (0.05) = 17.9; HSD (0.01) = 22.05, the mean (2018–19) versus mean (2019–20) were non-significant, mean (2018–19) versus mean (2020–21) $P < 0.01$ mean (2018–19) versus mean (2021–22) were significant ($P < 0.01$), mean (2019–20) versus mean (2020–21) were significant ($P < 0.01$) and mean (2019–20) versus mean (2021–22) were significant ($P < 0.01$) and mean (2020–21) versus mean (2021–22) was non-significant.

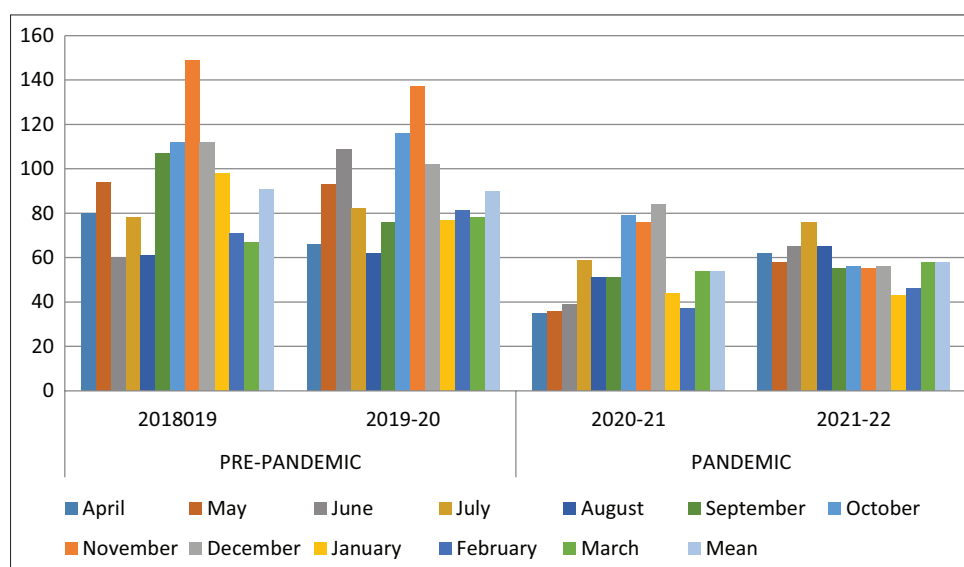
Major primary discharge diagnosis for medical admissions among children during the pandemic and the corresponding months in pre-pandemic period in Barbados is shown in [Table 2]. Mean monthly admissions from acute respiratory illnesses (acute exacerbation of asthma phenotypes and respiratory tract infections) and acute gastroenteritis was 5.4 (± 1.8) and 2.6 (± 0.7) during the pandemic months compared to 35.1 (± 7.2) and 5.3 (± 0.8) during the corresponding pre-pandemic months, respectively. Both these differences were statically significant ($P < 0.0001$). Monthly admission frequency from acute respiratory illnesses and acute gastroenteritis during the pre-pandemic and pandemic months is shown in [Figure 2]. The frequency of admissions has significantly increased during the pandemic compared with the pre-pandemic period for malignancies (Mean monthly admissions – Pandemic = 9.1 ± 1.9 and Pre-pandemic = 4.3 ± 1.2 ; $P < 0.0001$) and other infectious diseases (Mean monthly admissions – Pandemic = 8.4 ± 2.3 and Pre-pandemic 6.2 ± 1.5 ; $P = 0.1018$). Other infectious diseases (infections other than acute respiratory tract infections and acute gastroenteritis) included sepsis and bacterial meningitis (neonatal sepsis and

Table 1: Demographic profile of children admitted to the Queen Elizabeth Hospital during the pandemic and the corresponding pre-pandemic period in Barbados.

| | Pre-pandemic | | Pandemic | |
|-------------|-----------------------|----------------------|-----------------------|----------------------|
| | April 2018–March 2020 | | April 2020–March 2022 | |
| | | <i>n</i> =2168 | | <i>n</i> =1282 |
| Age groups | | | | |
| <5 years | 1450 | 66.9% (64.8%, 66.8%) | 724 | 56.5% (53.7%, 59.2%) |
| 6–10 years | 466 | 21.5% (19.8%, 23.3%) | 326 | 25.4% (23.1%, 27.9%) |
| 11–15 years | 252 | 11.6% (10.3%, 13.1%) | 232 | 18.1% (16.1%, 20.3%) |
| Gender | | | | |
| Female | 925 | 42.7% (40.6%, 44.8%) | 717 | 55.9% (53.2%, 58.7%) |
| Male | 1243 | 57.3% (55.2%, 59.4%) | 565 | 44.1% (41.3%, 46.8%) |

Table 2: Major primary discharge diagnosis for medical admissions among children during the pandemic and the corresponding months in pre-pandemic period in Barbados.

| Primary discharge diagnosis | Pre-pandemic | | Pandemic | |
|---|-----------------------|----------------------|-----------------------|----------------------|
| | April 2018–March 2020 | | April 2020–March 2022 | |
| Acute exacerbation of asthma phenotypes | 535 | 24.8% (23.0%, 26.7%) | 37 | 2.8% (2.0%, 3.9%) |
| Respiratory tract infections | 307 | 14.2% (12.8%, 15.8%) | 92 | 6.9% (5.7%, 8.5%) |
| Acute gastroenteritis | 127 | 5.9% (5.0%, 7.0%) | 60 | 4.5% (3.5%, 5.8%) |
| Other infectious diseases | 148 | 6.9% (5.9%, 8.0%) | 195 | 14.7% (12.9%, 16.8%) |
| Malignancies | 107 | 5.0% (4.1%, 6.0%) | 224 | 16.9% (14.9%, 19.1%) |
| Sickle cell disease | 88 | 4.1% (3.3%, 5.0%) | 49 | 3.7% (2.8%, 4.9%) |
| Seizures | 218 | 10.1% (9.0%, 11.5%) | 140 | 10.6% (9.0%, 12.4%) |
| Diabetes | 39 | 1.8% (1.3%, 2.5%) | 34 | 2.6% (1.8%, 3.6%) |
| Other non-infectious diseases | 607 | 28.1% (26.3%, 30.1%) | 486 | 36.7% (34.1%, 39.4%) |

**Figure 1:** Frequency of non-COVID-19 hospital admissions among children during the pandemic and the corresponding pre-pandemic period in Barbados.

meningitis as well as septicaemia or bacteraemia in children), urinary tract infection, dengue, bacterial infection of the skin and soft tissue, viral exanthemata's fever and viral infections of the nervous system in that order of frequency. The frequency of admissions from malignancy and other infectious diseases is shown in [Figure 3].

There were 240 admissions where intensive care was required during the pandemic period, while 279 admissions required intensive care during the corresponding months in the immediate pre-pandemic period. The difference was statistically not significant. The number of deaths from non-COVID-19 medical illnesses among children during the pandemic and the corresponding pre-pandemic period in Barbados is shown in [Figure 4]. The total number of deaths (23) during the pandemic period was smaller than the corresponding pre-pandemic period; however, the difference was statistically not significant ($P = 0.7913$).

DISCUSSION

Data from this long-term population-based prospective study has shown that the number of admissions for COVID-19-unrelated medical illnesses declined by 40% during the COVID-19 pandemic when compared to the corresponding months in the immediate pre-pandemic period. There are numerous reports of the pandemic-related decline in the utilisation of primary healthcare as well as emergency healthcare and much of this has been attributed to the disruption of healthcare delivery and limitations in the utilisation of the healthcare.^[2,6-9] However, there is a paucity of reported long-term data on the impact of this pandemic on the hospitalisation of children for COVID-19-unrelated illnesses.^[9,10] Therefore, this study provides fresh insight into yet another area of impact of this pandemic and substantiates the findings from our preliminary report.^[5,11]

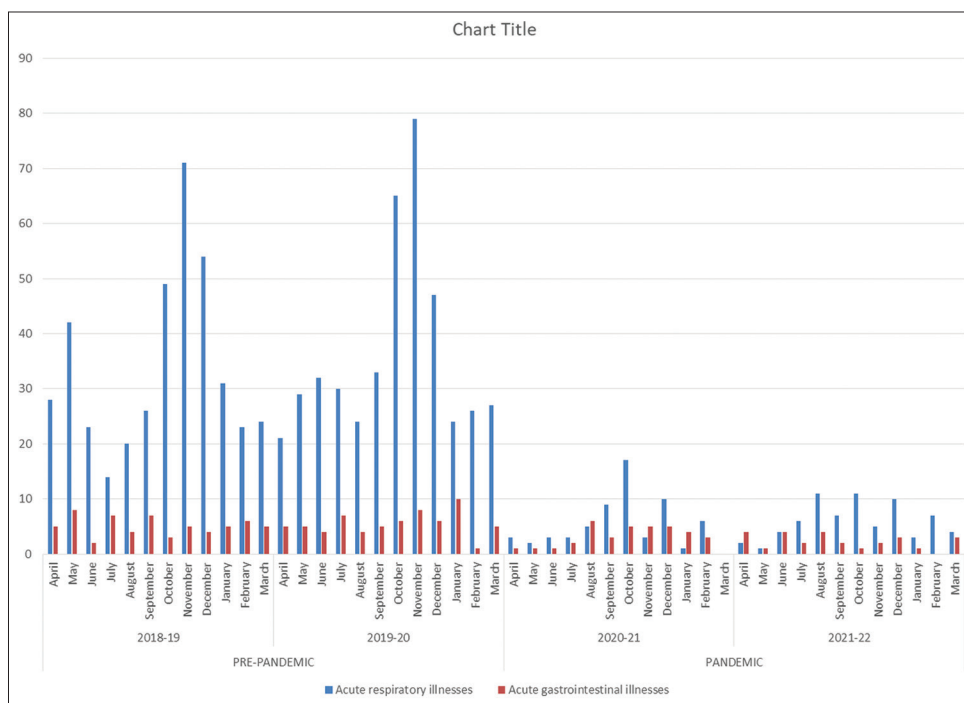


Figure 2: Monthly admission frequency from acute respiratory illnesses and acute gastroenteritis during the pre-pandemic and pandemic months in Barbados.

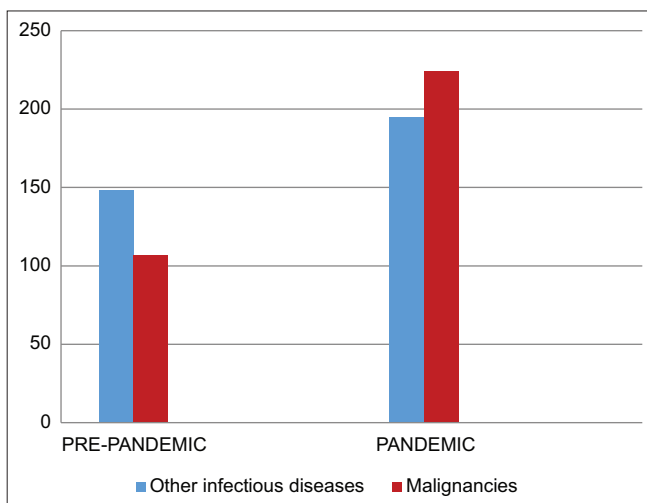


Figure 3: Frequency of admissions from other infectious diseases and malignancies during the pre-pandemic (April 2018–March 2020) and pandemic (April 2020–March 2022) periods in Barbados.

Analysis of the primary discharge diagnosis during the COVID-19 pandemic (April 2020–March 2022) and the corresponding period in the immediate pre-pandemic period (April 2018–March 2020) revealed some important findings. There was a significant decline in admissions from acute exacerbation of asthma phenotypes, respiratory tract infections and acute gastroenteritis. This decline was both in the absolute numbers as well as in relation to other conditions (proportion of all primary diagnoses) and once again, it was

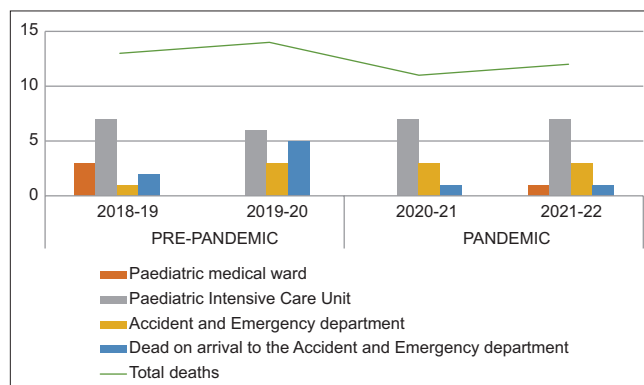


Figure 4: Deaths from non-COVID medical illnesses among children during the COVID-19 pandemic (April 2018–March 2020) and the corresponding pre-pandemic period (April 2020–March 2022) in Barbados.

seen consistently throughout the pandemic when compared to the corresponding pre-pandemic period. There is very limited data on the change in the pattern of childhood illnesses seen during this pandemic.^[6] In a previous study from early in the pandemic, Dann *et al.*, have also demonstrated, among children, a relatively high degree of decline in visits from respiratory illnesses (mostly dominated by asthma phenotypes and infections) and gastrointestinal illnesses (mostly dominated by infections) when compared to the decline in other illnesses.^[6] Closure of schools throughout the pandemic and periodic closure of preschools as well as the strict adherence to COVID-19 prevention

protocols which included hand hygiene, respiratory hygiene with compulsory face masks and social distancing would have limited the spread of infectious diseases among children during this period. Much of the asthma phenotypes and rhinitis seen in this population are related to respiratory tract infections.^[12-16] The decline in the number of visits for acute respiratory illnesses and gastrointestinal infections provides an explanation for the significant decline in the number of visits seen during the COVID-19 pandemic. Similar observations have been made in at least one other study.^[6]

Our data did not show any significant change in the proportion of hospitalised children who required intensive care during the pandemic when compared to the immediate pre-pandemic period. In addition, there was no significant change in the number of deaths among children with medical illnesses during the pandemic period when compared to the immediate pre-pandemic period. These findings reasonably support the notion that there were no delays in accessing healthcare by the parents. These findings are contrary to the findings from the studies reporting on the data from the early period of this pandemic and had shown that fear of contracting COVID-19 and possibly limitation of the services may have affected the uptake of routine healthcare and resulted in delay in seeking healthcare.^[7-10] These findings also provide evidence that routine care delivery and its uptake in this country were not affected throughout the COVID-19 pandemic largely due to the efforts of the Ministry of Health in tackling this pandemic.

CONCLUSION

There was a significant decline in admissions from medical illnesses among children. This decline in admissions was almost entirely due to a sharp and significant decline in admissions from acute respiratory illnesses and acute gastroenteritis. In addition, the decline in admissions was not associated with any significant change in the proportion of children requiring intensive care or any significant change in the number of deaths from medical illnesses among children in this country.

Authors' contributions

AK: Conceptualisation, analysis, draft writing of the manuscript and approval of the final manuscript. KM: Data collection analysis and approval of the final manuscript. KK: Conceptualisation, data analysis and final approval of the manuscript. RK: Data collection, draft manuscript preparation and final approval of the manuscript.

Acknowledgments

The authors wish to acknowledge Dr Janine Tait, Senior House Officer and all the House Officers rotating in the Department of Paediatrics during the period 2018 through 2022 for their assistance in the data collection.

Declaration of patient consent

The Institutional Review Board (IRB) permission obtained for the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Kumar A, King R, Morris K, Krishnamurthy K. Non-COVID-19 reasons for hospitalisation among children during the COVID-19 pandemic compared with the pre-pandemic period – A prospective population-based study from Barbados. *Karnataka Paediatr J* 2023;38:74-80.