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STUDY ON IMPACT OF COVID-19 PANDEMIC AT A TERTIARY CARE CENTRE IN ADMISSION PATTERNS AT PAEDIATRIC INTENSIVE CARE UNITS.

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Abstract: Background:While COVID-19 per se does not seem to represent a significant threat to the paediatric population, the pandemic has caused indirect detrimental consequences in the management of children in paediatric intensive care units (PICUs). This study analyses the impact of the pandemic on PICU admission patterns in a tertiary care centre.
Methods: We performed a retrospective observational study of all admissions to PICU during COVID-19 pandemic i.e. from May 2020-October 2021, and compared the data with corresponding pre-covid times.
Results: There were 3439 inpatient admissions compared to 9478 admissions in corresponding pre-covid months. There were 486 admissions to PICU in 2020 compared to 1400 from corresponding pre-covid months (September 2018-March 2020). During the pandemic, there was a reduction in all PICU admissions (14%) compared to pre pandemic period. There was a 79% reduction in respiratory admissions, and a 90% reduction in children admitted with exacerbation of asthma. We also observed a reduction in trauma related admissions (60%) and also 63.5% reduction in seizure disorders. There were 64 admissions (13%) with COVID positive status with multisystem inflammatory syndrome in children (MIS-C) accounting for 9 cases. *Conclusion:* The spread of COVID-19 and subsequent policies to address the pandemic has had wide-reaching implications on children's overall health seeking behaviour and wellbeing. A significant reduction in PICU admissions, particularly secondary to respiratory diseases, and lesser mortality in PICU was noted. This could be attributed to widely implicated public health measures like lockdown and shut down of schools. During times of pandemic and other public health emergencies, policy makers and service providers must ensure continued provision of essential healthcare and social services, including targeted responses for those with existing conditions to improve quality of life and reduce morbidity and mortality.

Keywords: COVID-19, Paediatric Intensive Care Units, Admission patterns.

Introduction

The outbreak of Coronavirus Disease (COVID-19) in Wuhan (China) was in the early December 2019, since then it spread across the globe affecting over 100 countries [1]. Children have been noted to be affected mildly by COVID-19, with symptoms such as fever, cough, sore throat, and sneezing [2-3]. Children are frequently exposed to non COVID-19 strains of coronavirus, and

emerging studies have suggested that this may provide some cross-protection against COVID-19 [4-5].

While COVID-19 per se does not possess significant threat to the pediatric population, the pandemic has caused indirect detrimental consequences in the management of pediatric patients and on overall health of children [6].Emerging evidence has shown that the pandemic has caused disruption of the delivery of health programmes globally. This disruption may be explained by factors such as challenges in keeping services running (due to healthcare worker redeployment or insufficient protective equipment), public fears around accessing healthcare services safely, and movement restrictions.

The number of children requiring paediatric intensive care unit (PICU) admission with either acute COVID-19, or related conditions such as the novel post-covid inflammatory syndrome referred to as Paediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS) or multisystem inflammatory syndrome in children (MIS-C), was relatively less compared with the number of adults requiring critical care admission following COVID-19 infection [7-8].

Delayed presentations and restricted access to health care due to public health strategies has raised concerns of increased morbidity and mortality, particularly in children with serious or chronic conditions [9]. Delayed diagnosis and treatment for complex chronic conditions may result in rapid deterioration in health and can have fatal consequences [10]. The aim of this paper is to assess the impact of COVID-19 pandemic on patterns of PICU admissions and to analyze the nature and magnitude of differences in PICU admissions.

Material and Methods

We performed a retrospective analysis of routinely collected information for all admissions to PICU of Maheshwara Medical College and Hospital. Admission patterns, associated comorbidities and outcomes during the pandemic period (2020-2021) for 18 months i.e. from May 2020 to October 2021 were compared with the corresponding months in pre-covid time.

Results

Admissions: Total inpatient admissions during covid time were 3439 and corresponding number during precovid time was 9478.There was 64% reduction in total inpatient admissions. Only 486 PICU admissions were observed compared to corresponding pre covid months where the number was around 1400. This represents a 65.3% reduction in PICU admissions during covid time (Figure 1 and 2).

Respiratory cases:A significant difference in number of PICU admissions was accounted by the respiratory diagnostic group comprising 79% reduction in PICU admissions with 297 fewer respiratory admissions compared to corresponding pre covid time. The greatest reduction in respiratory admissions was for asthma exacerbations with a relative reduction of 90% compared with corresponding pre covid times. Around 80% reduction was noted in other respiratory admissions too like wheeze associated lower respiratory tract infection (WALRI), Bronchiolitis and Pneumonia. (Figure 3).

Fig-1: Number of PICU admissions

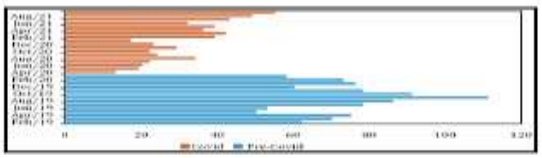


Fig-2: Inpatient admissions and PICU admissions

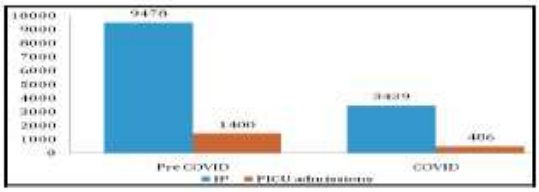
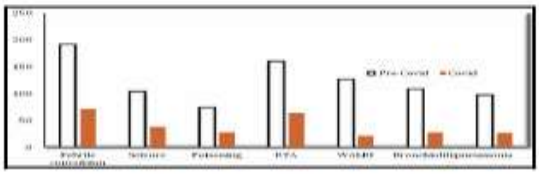


Fig-3: Pattern of PICU admissions

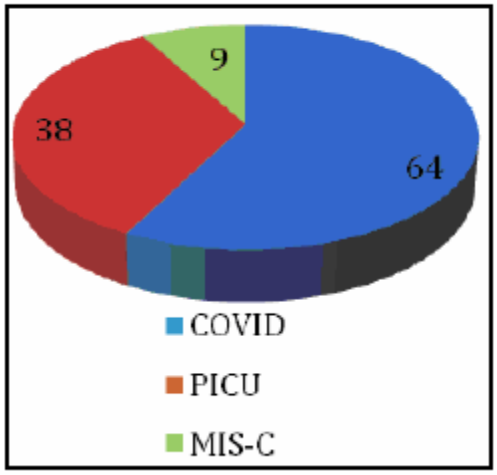


Central nervous system (CNS) cases: There was a 42% relative reduction in CNS related admissions like meningitis, encephalitis and hydrocephalus. A reduction of 63.5% was noted for admissions for seizure disorders. There was remarkable fall in admissions for febrile seizures too approximating 73%.

Trauma: There was 60% reduction in trauma related admissions during covid time in comparison to pre covid times, mostly attributable to public health measures laid down to curb the spread of the pandemic.

Nephrotic Syndrome and Diabetic Ketoacidosis (DKA): There was 80% reduction in admissions due to nephrotic syndrome during covid time (2 cases) compared to corresponding precovid time (16 cases). Around 40% reduction was noted in admissions due to DKA. *COVID-19/ MIS-C:* While there was a major impact of the pandemic on the overall number of admissions to PICU, the actual number of paediatric patients with COVID-19 only totalled to 64 (13.1%). Out of 64 cases 9 cases (14%) were diagnosed with MIS-C (Figure 4).

Fig-4: COVID-19 positive cases



Poisoning cases: There was 63% reduction in poisoning cases during pandemic period, compared to the corresponding pre covid times.

Discussion

During COVID-19 pandemic, there were approximately 6000 fewer admissions, 16 fewer child deaths in PICU compared to corresponding pre pandemic time. A study conducted by Sophie Degiorgio et al showed a drop in admissions by 57.7% [8]. The reduction in respiratory diseases (in particular asthma exacerbations) was the major contributor to the decrease in PICU admissions during pandemic time.

Reports from North and South America have also revealed a similar trend of significant reduction in respiratory viral illnesses [11-13]. The reasons are not entirely clear, although it may be attributed to the effectiveness of various public health interventions which were widely adopted worldwide during the pandemic. This included 'stay-at-home orders', social distancing measures, mobility restrictions, school closures, use of masks, frequent hand washing and shielding of vulnerable populations. Yet another notable finding in this study was reduction in the absolute number of child deaths in PICU, with similar comparable studies from other parts of the world [13-14]. It remains to be seen whether some of the public health strategies continue to be widely adopted and remain sustained in the community. It is as yet unclear how reduced exposure to respiratory pathogens among infants and children during the pandemic projects on future seasonal and inter-seasonal respiratory viral surges.

The pandemic has virtually affected every domain of admission pattern. With respect to central nervous system related disorders, our study showed marked reduction in admissions for seizure disorder including febrile seizures during covid time. Altered health seeking behavior resulting in delayed presentation has been implicated as a potential concern during the pandemic [14]. There were loss of follow ups of chronic cases like nephrotic syndrome , where only 2 cases were admitted during covid time compared to 16 cases in corresponding pre covid times.

Overall, COVID-19 and MIS-C accounted for fewer PICU (38 out of 486 cases) admissions in pandemic time as it ran a milder course in paediatric population. Just under half of all reported cases of PIMS-TS in the UK were admitted to PICU and it was established that these were predominantly for vasoactive medications rather than respiratory support [15]. Nevertheless, comparative analysis of wider preceding time periods as well as from other PICU systems is required before confirmation of this effect.

This study does not include any other measures of health impact on children such as primary care attendances, hospitalisation, immunisation and other measures such as education, nutrition, fitness, poverty and mental health. These are also required to build an overall assessment to consider the risks and benefits posed by any large scale public health intervention during an emergency in the future. An interrupted time series or regression discontinuity design analysis may be required to specifically analyze this association.

However, the timing and nature of interventions were variable in different countries. A regional approach was also pursued within some countries and these introduced significant barriers too. As such our study merely describes the association between pandemic- related variables and the PICU case-mix, outcome differences, rather than test for causation.

Conclusion

During pandemic time we found a significant reduction in PICU admissions, particularly secondary to respiratory diseases, and fewer child deaths in PICU. We could speculate that this phenomenon could be ascribed mainly to the lower circulation of infectious agents, secondary to the adoption of simple prophylactic measures such as hand hygiene and face masks in addition to lockdowns and school closures. On the other hand, altered health seeking behavior due to restricted access to health

care may result in delayed presentation, diagnosis and treatment, particularly in children with preexisting comorbidities or chronic illnesses. However, further evidence may be needed to confirm and better quantify this trend.

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