

Research Article

Impact of Preexisting Comorbidities on Pediatric Emergency Admissions during Covid-19 Pandemic

Lakshmi Muthukrishnan* and Radhika Raman

Kanchi Kamakoti CHILDS Trust Hospital, India

*Corresponding author

Lakshmi Muthukrishnan, Kanchi Kamakoti CHILDS Trust Hospital, 4153, Tower 4A, Prestige Bella Vista, Ayyappanthangal, Chennai, Tamil Nadu, India, Tel: 944174947; Email: luxc99@gmail.com

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Keywords

• Pediatrics Emergency; COVID-19; Children

Abstract

1.1. Aim: To document the clinical profile and outcome of children below 18 years of age with SARS-CoV-2 infection with relation to pre-existing comorbidities.

1.2. Methods: Prospective, observational study at the Emergency Department of a tertiary care children's hospital in South India from May 2020 to April 2021. Details regarding demography, clinical presentation, history of contact with positive SARS-CoV-2 patients, preexisting comorbidities, emergency management, the requirement of intensive care treatment, diagnosis at discharge, and outcome were analyzed for all SARS-CoV-2 positive children who required emergency care.

1.3. Results: A total of 196 children were positive for SARS-CoV-2 and 109 children among them required emergency management. Among them, 19% were infants, 61% were from 1 to 12 years of age and the remaining 19% were adolescents. The Mean age was 6.3 years. There were 23 children (21.1%), with preexisting comorbidities. Fever was the most common presenting complaint in children in both groups. 26.1% of children with comorbidities and 9.3% of children without comorbidities had severe presenting symptoms which was statistically highly significant. The mean duration of stay was 7 days in children with comorbidities 3 days in children without comorbidities which was also statistically significant. 34.7% of children with preexisting comorbidities and 12.7% of previously healthy children required intensive care management. We observed Multisystem Inflammatory Syndrome in Children (MIS-C), only in children without comorbidities (8.2%). Nearly 2/3rd of children with COVID pneumonia required assisted ventilation. Mortality was less than 1% which was attributed to the preexisting malignancy and not because of the severity of SARS-CoV-2 infection.

1.4. Conclusion: SARS-CoV-2 infection in admitted children presents with great clinical variability. Supportive therapy is recommended in the majority of children with SARS-CoV-2 infection. Preexisting comorbidity does not seem to increase the severity of COVID-19, however, we emphasize the importance of emergency management and intensive monitoring for a better prognosis.

INTRODUCTION

COVID-19 pandemic caused by Severe Acute Respiratory Syndrome CoronaVirus 2 (SARS-CoV-2), is a major threat to global health and a public health emergency. Approximately 14% of all cases of COVID-19 reported to the Centers for Disease Control and Prevention (CDC) were among children (as of May 12, 2021) [1]. In India, < 12% of all confirmed cases are in individuals < 20 yr [2,3], while this population constitutes approx. 41% of the population [4,5]. Most cases in children are mild, and treatment consists of supportive care. Data on the clinical profile and outcome of children with preexisting comorbidities requiring emergency management during this pandemic is limited. We describe our experience of SARS-CoV-2 in children with an emphasis on the role of emergency treatment particularly in children with comorbidities. This study aimed to evaluate the correlation between comorbidities and their role in the exacerbation of disease in COVID-19 patients.

METHODS

We conducted a prospective observational study in the emergency department of a pediatric tertiary care hospital in

South India from May 2020 to April 2021. The study was approved by the Institute Ethics Committee and informed consent was taken from the patient caretaker. Newborns were excluded.

Diagnosis of SARS-CoV-2 infection and Multisystem Inflammatory Syndrome in Children (MIS-C) were based on the CDC guidelines. Contact was defined based on the CDC guidelines i.e, within 6 feet of someone for a period of a total of 15 minutes or more with a person with laboratory-confirmed or probable SARS-CoV-2 infection. All children were triaged in the Fever Surveillance area of the hospital at the designated location and Integrated Management of Neonatal and Childhood Illness (IMNCI), type approach for COVID-19 in children as mild, moderate, and severe categories based on clinical findings at the time of admission. Those who required resuscitation were admitted to the emergency ward. Children were tested for SARS-CoV-2 infection because of the following. (i) symptoms suggestive of COVID-19, (ii) children requiring emergency care tested because of contact with a SARS-CoV-2-positive case, and (iii) hospitalized children with underlying comorbidities tested as part of a hospital screening program.

Confirmed COVID-19 was defined as either positive SARS-CoV-2 real-time reverse-transcriptase polymerase chain reaction (RT-PCR), performed by Indian Council of Medical Research (ICMR), approved laboratories or a positive antibody test performed with ICMR-approved YHLO SARS-CoV-2 IgG and IgM antibody titer assay kits (Shenzhen YHLO Biotech Co. Ltd.) as per manufacturer's instructions.

Only confirmed cases were enrolled in the study. SARS-CoV-2 positive children in this cohort were classified into Group I comprising of children having underlying comorbidities like heart disease, renal, diabetes, malignancy, metabolic disorders, neurological, hepatobiliary, surgical conditions, etc, and Group II without underlying comorbidities. Variables were compared between the groups. The study population was categorized as with and without comorbidities.

Designated doctors and the study nurses collected all details in standardized and approved case report forms, which were then entered into the Microsoft Excel spreadsheet. Vital signs (tachycardia, tachypnea, and hypotension), were classified according to normal values for the age [6]. Details regarding demography, clinical presentation, history of contact with positive COVID 19 patients, underlying comorbidities, emergency management details, the reasons for transfer to intensive care unit, the requirement of assisted ventilation, duration of hospital stay, the severity of present illness with relation to underlying comorbidities, diagnosis at discharge, and outcome were analyzed. Treatment outcomes were defined as discharge or death.

RESULTS

Out of 1785 admissions in the study period, a total of 196 (10.9%), children were positive for SARS-CoV-2 and 109 children among them required emergency management. Among them, 19% were infants, 61% were from 1 to 12 years of age and the remaining 19% were adolescents. The Mean age was 6.3 years. Fever was the most common presenting symptom in children in both groups (Table 1). Other presenting complaints were feed refusal, fatigue, and complaints related to respiratory, gastrointestinal, neurological, and cardiovascular systems.

One third of children (37.6%), had history of contact with household adults with COVID 19. Underlying comorbidities were observed in 23 children (21.1%), which were underlying lymphoreticular malignancy (6.4%), seizure disorder (2.7%), diabetes mellitus (0.9%), congenital heart disease (1.8%), congenital hydrocephalus (0.9%), hydronephrosis (0.9%), neurogenic bladder (0.9%), congenital adrenal hyperplasia (0.9%), chronic diarrhea (0.9%), nephrotic syndrome (0.9%), acquired immunodeficiency syndrome (0.9%), hirshsprung disease (0.9%), Pulmonary Tuberculosis (0.9%), Vesicoureteral reflux (0.9%) etc. Two children with comorbidities were on immunosuppressant medications. Majority (88.4% without comorbidities and 43.5% with comorbidities), were mild symptomatic. 9.3% of children without comorbidities and 26.1% of children with comorbidities had severe COVID 19 symptoms which was statistically highly significant ($p < 0.001$) (Table 2).

All children received emergency interventions in the form of vascular access, oxygen support, intravenous administration

Table 1: Clinical Profile in children with and without comorbidities.

Clinical symptoms	With Comorbidities (n=23)	Without comorbidities (n=86)
Fever	11/23(47.8%)	68/86(79%)
Feed Refusal	2/23(8.6%)	20/86(23.2%)
Fatigue	3/23(13%)	15/86(17.4%)
Respiratory symptoms	4/23 (17%)	12/86(14%)
Gastrointestinal symptoms	4/23(17%)	28/86(32.5%)
Neurological symptoms	5/23(21.7%)	6/86(6.9%)
Cardiovascular symptoms	2/23(8.6%)	3/86(3.4%)

Table 2: The severity of presenting clinical symptoms.

Symptom category	Comorbidity				Total	
	No		Yes			
	Count	%	Count	%	Count	%
Mild	76	88.4	10	43.5	86	78.9
Moderate	2	2.3	7	30.4	9	8.3
Severe	8	9.3	6	26.1	14	12.8
Total	86	100.0	23	100.0	109	100.0

of antibiotics, steroids, antiviral drugs, point of care testing of glucose and ketones, intravenous fluids and inotropes administration, hemodynamic monitoring, bedside ultrasound imaging, radiography, and echocardiography assessment, assisted ventilation, endotracheal intubation, etc. Hemodynamic instability with profound hypotension was noticed in 2% of children. One-third of children (34.7%), in children with comorbidities and 11 of previously healthy children (12.7%), were transferred to Pediatric Intensive Care Unit (PICU), for further management (Table 3).

We observed Multisystem Inflammatory Syndrome in Children (MIS-C) only in children without comorbidities (8.2%). COVID pneumonia was present in 6.4% of the study population and 5 children required ventilator support (Flow chart 1).

Two children had new-onset Diabetes Mellitus. The mean duration of stay was 3 days in children without comorbidities and 7 days in children with comorbidities which was statistically highly significant ($p < 0.001$) (Table 4 and Graph 1).

DISCUSSION

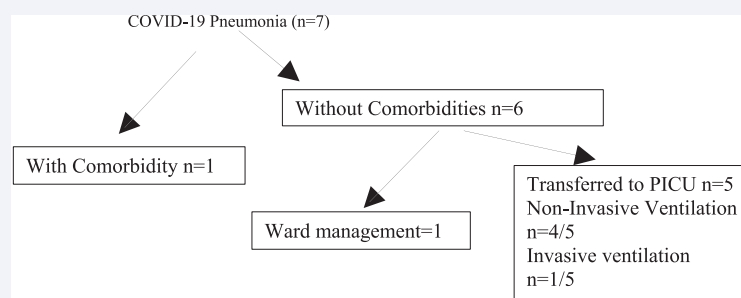
Our emergency department usually receives a large number of serious cases, including acute complications of diabetes, asthma, and epilepsy, and other common emergencies, such as poisoning or burns. A prospective study from this setting highlights the clinical characteristics, disease progression, and outcome of 109 children admitted with COVID-19 with relation to the underlying comorbidities.

A study from the Western country has reported that underlying conditions were more common among school-aged children with severe outcomes related to COVID-19: among school-aged children who were hospitalized, admitted to an intensive care unit (ICU), or who died, 16%, 27%, and 28%, respectively, had at least

Table 3: Clinical Characteristics of children requiring PICU care (n=19).

Clinical condition	With Comorbidities(n=23)	Without Comorbidities(n= 86)
Very Severe Pneumonia	1	5
Severe DKA	1	1
with severe metabolic acidosis	1	
Status Epilepticus	1	
MIS-C with Hypotensive shock		4
CHD with CCF	1	
Electrical Burns with Septic Shock		1
HIV infection with TBM	1	
ALL with Tumour lysis and MODS	2	

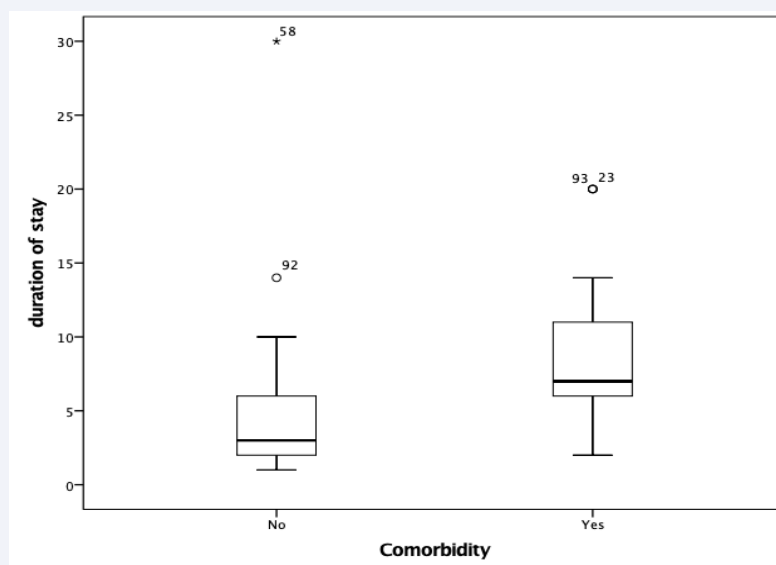
DKA: Diabetic Keto Acidosis; IEM: Inborn Error of Metabolism; MIS-C: Multisystem Inflammatory Syndrome in Children; CHD with CCF: Congenital Heart Disease with Congestive Cardiac Failure; HIV: Human Immunodeficiency Virus; TBM: Tuberculous Meningitis; ALL: Acute Lymphocytic Leukemia; MODS: Multi-Organ Dysfunction Syndrome.



Flow Chart 1 Clinical Characteristics of COVID-19 Pneumonia cases.

Table 4: Duration of hospital stay in both groups.

	Comorbidity								p value
	No				Yes				
	N	Min	Max	Median	N	Min	Max	Median	
AGE(Yr)	86	0.1	18.0	5.0	23	0.2	17.0	4.0	0.616
duration of stay	86	1	30	3.0	23	2	20	7.0	< 0.001



Graph 1 Mean duration of hospital stay between 2 groups. Mortality was less than 1% which was attributed to underlying acute leukemia with tumor lysis syndrome, septic shock, and multiorgan dysfunction syndrome.

one underlying medical condition [7]. In our study, 21%, 30%, and 4% had preexisting comorbidities in the same categories as stated above. Lazznerini et al., have reported that about one in six children accessing the health system with a presentation suggestive of COVID-19 had comorbidity (355/2,148; 16.5%) [8].

Likewise, when compared to the available meta-analytical data, about half to two-thirds of children presented with fever in both groups, and fewer children (17%), in our series presented with respiratory symptoms. Gastrointestinal symptoms were more common (32.5%), among previously healthy children as against up to 6-13% in the literature [9]. Neurological complaints were more common (21.7%), in children with comorbidities, similar to the study from Italy which has reported the overall incidence of neurological presentation in general to be 19% [8].

We observed that there was a statistically significant correlation between the mean duration of hospital stay in children with comorbidities when compared to previously healthy children. However, in a similar study from North India by Rao S et al., there was no difference in the mean duration of hospital stay in both groups which was 9 days [10].

A notable finding in our series was that MIS-C was found in previously healthy children (8.2%) only. This has been reported in other studies also [10-12]. It is stated that the presence of comorbidity dysregulates or blunts the immunological host responses causing the severe infection but a hyper-inflammatory immune response like MIS-C/Kawasaki Disease (KD), is not seen.

Literature reviews state that the pediatric coronavirus disease-19 (COVID-19), infection is relatively mild when compared to adults, and children are reported to have a better prognosis. Mortality in children appears rare [13]. Current evidence suggests that children with medical complexity, with genetic, neurologic, metabolic conditions, or with congenital heart disease might be at increased risk for severe illness from COVID-19 [1,14]. Similarly yet another meta-analytical study by Tsankov BK et al., has reported that children with comorbidities are at higher risk for severe manifestations of COVID-19 and associated mortality relative to previously healthy children with specific reference to childhood obesity [15]. We did not observe any obesity-related severity in our study group. Apart from the presence of pre-existing comorbidities, ethnicity is also been considered to be independent risk factors for severe disease [16]. In contrast to this observation, the mortality in our study was less than 1% and was attributed to the underlying severity of the comorbidity rather than the disease severity of SARS-CoV-2 infection.

CONCLUSION

SARS-CoV-2 infection in admitted children presents with great clinical variability. Supportive therapy is recommended in the majority of children with SARS-CoV-2 infection. Preexisting comorbidity does not seem to increase the severity of COVID-19, however, we emphasize the importance of emergency management and intensive monitoring for a better prognosis.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent.

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