ORIGINAL ARTICLE

COVID 19 IN CHILDREN: AN EXPERIENCE FROM A PAEDIATRIC TERTIARY CARE SETTING

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Background: The pandemic of COVID 19 has affected a number of people around the globe. The data from paediatric population is scarce. The present study is aimed to present the paediatric perspective of the disease in terms of different clinical presentations, laboratory parameters, complications, and outcomes so as to develop an insight into disease manifestations in children. M**ethods**: This descriptive case series was conducted in the department of Paediatrics after approval of institutional review board. All children admitted in paediatric unit with confirmed SARS-COV-2 infection either by PCR or antibody test were included in the study. Patients' characteristics were documented on a predesigned proforma and analysed using SPSS 26.0. **Results**: A total of 17 patients comprising 13 (76.5%) male and 4(23.5%) female were included in the study. The major clinical features were fever, cough and shortness of breath documented in 15 (88.2 %) patients. Major complications were shock in 13 (76.5%), respiratory complications in 16 (94.11%), CNS complications in 4 (23.5%), cardiac complications in 5 (29.4%), hepatic involvement in 3 (17.6%) Acute Kidney Injury in 4 (23.5%) patients and 9 (52.9 %) patients were labelled as having Multisystem Inflammatory Syndrome in Children (MIS-C). A total of 7 (41.2%) patients had coexistent comorbid diseases. A total of 13 (76.47%) patients were discharged, 2 (11.8%) patients expired and 2 (11.8%) left against medical advice. **Conclusion:** The clinical presentation of paediatric patients with SARS-COV-2 infection is highly variable. Multisystem inflammatory syndrome associated with SARS-COV-2 must be considered in the differential diagnosis of children presenting with multiorgan dysfunction.

Keywords: SARS-COV-2; Multisystem inflammatory syndrome; Inflammatory markers

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INTRODUCTION

Since its emergence in December 2019, COVID 19 has affected a number of people around the globe and has been declared as a pandemic by WHO in March 2020. Data from all over the world shows that adult population is primarily affected and presented with deadly complications and outcomes. However, the paediatric patients have also been reported to be affected by this deadly virus although to a much lesser extent as compared to adults. A study from China reported only 2% patients below 19 years out of a total of 72314 positive cases.[1,2]

The SARS-COV-2 represents the group of viral pathogens that mainly present with respiratory manifestations like fever, shortness of breath, cough, body aches and pneumonia. Multiorgan dysfunction including shock, renal failure, cardiac involvement and ARDS has also been reported with documentation of mortality especially in patients with coexisting diseases advanced age etc.[3] In contrast to most other viral respiratory ailments, paediatric population is found to be less prone to COVID 19 and mainly show less severe illness and low mortality[4]Paediatric population has been reported to be affected in 1–2% of the total cases with nearly 6% labelled as having severe illness mandating paediatric ICU admission.[5]

The infection manifestations range from asymptomatic carriers to patients with worst pulmonary involvement presenting as severe respiratory distress. The critically ill patients are usually the ones with underlying pre-existing disease states.[6,7] Inspite of this fact, severe disease with shock like presentation requiring inotropic support and manifestations like high grade non resolving pyrexia, GIT disturbances, skin rash, conjunctival congestion in combination with raised inflammatory and cardiac markers have been reported in a number of children from different parts of the world.[4]

Inspite of an underdeveloped defence system, a number of mechanisms have been postulated to be responsible for the lesser involvement of paediatric patients.[8] The ACE 2 receptors are thought to be scanty in number and immature in functionality in children. As SARS-COV-2 utilizes these receptors so its lesser availability in children could be a reason for a lesser disease frequency in children.[9] Secondly, an efficient innate immunity, presence of thymus and CD8 T cells in children are thought to be responsible for better viral clearance.[10]

The prime objective of the present study is to present the paediatric perspective of SARS-COV-2 in terms of different clinical presentations, lab parameters, complications, and outcomes so as to develop an insight into disease manifestations in children. As data from our region is scarce, the present study will highlight the paediatric aspects of COVID 19 and help the paediatricians deal with the paediatric patients more effectively during this pandemic.

MATERIAL AND METHODS

The descriptive case series was conducted in the department of Paediatrics from 1st November 2020 to 30th April 2021 after approval of institutional review board. Informed consent was obtained from the parents. All children admitted in paediatric unit with confirmed SARS-COV-2 infection either by PCR or antibody test were included in the study. Patient characteristics including age, gender, weight, presenting complaints, duration of illness, comorbid conditions, duration of hospital stay, clinical findings, radiological features, laboratory parameters and outcome were documented on a predesigned *pro forma*. The data was entered and analysed using SPSS26. Mean and standard deviation was calculated for continuous variables like age, weight, LDH, Ferritin and CRP values. Frequency and percentages were calculated for categorical variables. Chi square test was used for significance testing. *p*-value ≤0.05 was considered significant.

RESULTS

A total of 17 patients with confirmed SARS COV 2 infection either by PCR or antibody test were included in the study. Of these,13 (76.5%) were male and 4(23.5%) were female. Positive PCR was documented in 12 (70.6%) patients while antibodies were documented in 5 (29.4%) patients. Mean age of the participants was 33.882±57.659. Mean weight of the patients was 14.805±20.095 kg. Mean duration of symptoms was 6.00±3.061 days and mean duration of hospital stay was 10.0±5.873 days. (Table-1) The major clinical features were fever in 15(88.2%), cough in 15 (88.2%), shortness of breath in 15 (88.2%), cyanosis in 13 (76.5%), fits in 4 (23.5%), reluctant to feed in 13 (76.5%) and rash in 2 (11.8%). (Table-2)

One patient presented with hypertension. Patients required oxygen by face mask in 5 (29.4%) and bubble CPAP in 12 (70.6%). Among inflammatory markers LDH was raised in 14 (82.35%), CRP in 10 (58.82%), D dimers in 12 (70.6%) and Ferritin in 8 (47.1%). Due to paucity of resources, tests for inflammatory markers could not be performed in all patients. (Table-3) Major complications were shock in 13 (76.5%), respiratory complications in 16 (94.11%), CNS complications in 4 (23.5%), cardiac complications in 5 (29.4%), hepatic involvement in 3 (17.6%) and Acute Kidney Injury in 4 (23.5%) patients. Based on definition by WHO[11], 9 (52.9 %) patients were labelled as having Multisystem Inflammatory Syndrome in Children (MIS-C). (Table-4) Chest x-ray was performed in all patients with 16 (94.11%) having radiological findings. HRCT chest could only be performed in 7 (41.2%) patients with all showing radiological findings.

Lymphopenia and Neutrophil to lymphocyte ratio >3 was documented in 8 (47.05%) and thrombocytopenia in 4 (23.5%) patients. A total of 7 (41.2%) patients had coexistent comorbid diseases like congenital heart disease, congenital hydronephrosis, Downs Syndrome, obesity, Thalassemia, Measles and pulmonary Tuberculosis. The disease was classified as moderate in 5 (29.4%) and severe in 12 (70.6%) patients. (Table-1)

A total of 13 (76.47%) patients were discharged, 2 (11.8%) patients expired and 2 (11.8%) left against medical advice. Patients were divided into survivors and non survivors presuming those who left against medical advice as non survivors keeping in view their critical state of health and our hospital being the only tertiary care hospital in the area. Based on that,13 (76.5%) patients were considered as survivors and 4 (23.52%) as non survivors. (Table-1) Survival was assessed in relation to gender, age groups, comorbidity, neutrophil to lymphocyte ratio and complications. The difference was not found to be statistically significant as regards gender, age groups, comorbidity and NLR. The difference was statistically significant in patients with MIS-C (p=0.031) and CNS complications (p= 0.006). (Table-5)

Table-1: Patient Characteristics (n=17)

Age in months	33.824±57.659	
Weight in kg	14.805±20.095	
Duration of hospital stay	10.000±5.873	
Duration of symptoms	6.000±3.061	
Gender	**No. of patients**	**Percentage**
Male	13	76.5
Female	4	23.5
Age groups		
1 month to 1 year	9	52.9
>1year to 5 years	5	29.4
>5 years	3	17.6
Co morbid disease		
Present	7	41.2
Absent	10	58.8
Outcome		
Discharged	13	76.5
Expired	2	11.8
Referred	0	0
LAMA	2	11.8
Survival		
Survivors	13	76.5
Non survivors	4	23.5
Severity		
Moderate	5	29.4
Severe	12	70.6

Table-2: Clinical features (n=17)

Clinical Features	Frequency	Percentage
Fever	15	88.2
Cough	15	88.2
Cyanosis	13	76.5
Shortness of breath	15	88.2
Rash	2	11.8
Diarrhoea	3	17.6
Fits	4	23.5
Reluctant to feed	13	76.5

Table-3: Laboratory Parameters (n=17)

Parameters	Raised	Normal	Not Done
LDH	14 (82.4%)	1 (5.9%)	2 (11.8%)
CRP	10 (58.8%)	5 (29.4%)	2 (11.8%)
D Dimers	12 (70.6%)	1 (5.9%)	4 (23.5%)
Ferritin	8 (47.1%)	2 (11.8%)	7 (41.2%)
ALT	3 (17.6%)	14 (82.4%)	0
Urea	5 (29.4%)	12 (70.6%)	0
Creatinine	4 (23.5%)	13 (76.5%)	0
Cardiac enzymes	5 (29.4%)	3 (17.6%)	9 (52.9%)

Table-4: Frequency of complications

Complications	Frequency	Percentage
Shock	13	76.5
MIS-C	9	52.9
Acute Kidney Injury	4	23.5
Respiratory	16	94.11
Cardiac	5	29.4
Hepatic	3	17.6
CNS	4	23.5

DISCUSSION

The data on paediatric patients with SARS-COV2 is scarce with studies on limited number of patients. Chen *et al* reported the disease in 11 paediatric patients with7 males and 4 females, aged 7 months to 16 years, with a median age of 11 years and 5 months. The majority of patients (9 out of 11) in this study were 5 years of age or older.[12] Our study also documented more male patients as compared to females. However, majority of our patients (52.9%) were below one year of age. Another systematic review evaluating COVID 19 in under 5 children documented that 53% patients were under one year of age with 65% male patients.[13]

The different case series of paediatric patients from China have demonstrated that the children present with less severe disease manifestations. Different studies from China including 20 and 9 children[14,15] with SARS-COV-2 is reported in the literature. The findings of these studies showed that majority of patients presented with common respiratory symptoms with fever (50%) and cough (38%) being the most common. Clinical features like rhinitis, cough, fatigue, fever of low intensity were reported as the common features with shortness of breath, cyanosis and reluctant to feeding being the presenting features in patients with more severe illness.[16] Similar findings were documented in our study as well with fever, cough and shortness of breath being the commonest symptoms. Our study documented seizures in 4(23.5%) patients.

Another meta analysis[17] encompassing 20 studies on paediatric patients, reported that 13% patients were asymptomatic while headache (67%), fever (55%) and cough (45%) were the most common symptoms. Commonly reported laboratory findings included raised inflammatory markers including ferritin in 26%, procalcitonin in 25%, CRP in 19%, LDH in 11% and D Dimers in 15%. Lymphopenia was documented in 15% and leukopenia in 12%.[17] Our study also documented markedly raised inflammatory markers especially LDH and D Dimers. Lymphopenia was documented in approximately half of the study population in our study. This meta-analysis showed only minor differences in prevalence of normal HRCT chest (33%), consolidation (29%) and typical ground glass opacification (36%).[17] We could not perform HRCT chest in all patients due to paucity of resources in our setup. HRCT chest was performed in 7 patients with all showing radiological findings.

In a systematic review including 65 studies,[13] disease severity was documented as mild in 44.9%, moderate in 50.1% and severe in 4.9%. Mortality was documented in 1 (0.8%) in this review[13] while Badal *et al* documented 0.3% mortality.[17] Our study documented severe disease in a significant number of patients who required inotropic support and oxygen with a mortality of 11.8%. Patel *et al* in their systematic review documented underlying comorbid disease in 21.4% children. The diseases included asthma and cardiovascular disease.[18] More than one third of our study population also had underlying comorbid diseases like congenital heart disease, Down's syndrome, thalassemia, congenital hydronephrosis. Patel *et al* reported that only 57.1% of patients had abnormal chest x-ray.[18] In contrast, more than 90% of our study population had abnormal chest x-ray.

CONCLUSION

The clinical presentation of paediatric patients with SARS-COV-2 infection is highly variable. Multisystem inflammatory syndrome associated with SARS-COV-2 must be considered in the differential diagnosis of children presenting with multiorgan dysfunction. There is a need for enhancing the number of tests performed in children to gather and report every possible presentation. This would add to the existing knowledge of the disease in children and help improvise guidelines for optimal management of severe disease in children.

Limitations of the study

We experienced a lot of resistance from parents in getting the PCR for COVID 19 done for suspected paediatric patients. Furthermore, owing to paucity of resources in our hospital and poor socioeconomic status of the patients, some investigations could not be carried out uniformly in all patients.

AUTHORS' CONTRIBUTION

SB: Literature search, data analysis & interpretation, write-up. SYHG: Literature search, proof reading. ZA: Data collection. SB: Proof reading. FA: Data collection. TSS: Conceptualization of the study design.

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