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Laboratory derangements and clinical picture of Covid-19 in pediatric age group: A retrospective study

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ABSTRACT

Aim: To assess the clinical presentation and laboratory derangements of pediatric covid-19 patients admitted to the tertiary care hospital.

Methodology: The present retrospective study was started after the approval of the Institutional Ethics Committee. Clinical (Sp02, final diagnosis and outcome) and biochemical parameters (Complete Blood Count, Liver Function Test, Renal Function Test, Lactate De-Hydrogenase, D-dimer, C-Reactive Protein, and Serum ferritin) of pediatric covid-19 patients were collected from Central Laboratory and Medical Record Department of our institution. Patient names were anonymized and data were analyzed. The results are expressed in percentages.

Results: A total of 16 pediatric covid-19 patient details were identified and collected who were admitted during our study period. Out of 16 patients, 09 (56.2%) were female and the remaining 07 (43.7%) were male. Out of 16, 05 patients had mild covid, 07 were moderate and the remaining 04 suffered from severe covid-19 infection. The mean values of oxygen saturation, LDH, D-dimer, CRP, and Ferritin were 88%, 249.4U/L, 1140.9 ng/ml, 16.17 mg/dl, and 61.7 μg/L respectively. Mean values of 17.9 mg/dl and 0.4 mg/dl were recorded for blood urea and S.creatinine. Regarding liver function tests, mean values of 1.7mg/dl, 0.2mg/dl, 1.5mg/dl, 82.4 U/L, 55 U/L, 135.6 U/L respectively noted for total bilirubin, direct, indirect, SGOT, SGPT and ALP. Regarding patient outcomes, all the patients were covered and discharged from the hospital.

Conclusion: The present study has found an increase in laboratory mean values of liver function tests but the mean values of C-Reactive protein, LDH, and d-dimer which are the acute inflammatory markers are highly disrupted compared to normal ranges.

KEYWORDS: COVID19, Laboratory parameters, Pediatric, Retrospective studies

INTRODUCTION:

The entire world faced the pandemic of Covid 19 from December 2019; Covid-19 infection led to restrictions worldwide from traveling and even moving out of their homes was a risky situation. Entire populations of various nations of all age groups were affected and the pediatric and geriatric age groups were considered to be more vulnerable groups. Government-led various restrictions to combat infection and started vaccinating their population against the covid 19 infection. Vaccine efficacy was extensively studied for the adult age group but not in children. All the adult population was vaccinated in a short span and were protected from the severity of infection but not so with the pediatric age group. When it comes to the pediatric age group the clinical studies available are fewer in number to assess the prognosis and severity of the infection. As the pandemic began, multiple cases of multi system inflammatory syndrome in children related to covid- 19 (MIS-C) were reported. [1–3]

There was an urgent need to optimize their management strategies in neonates born to covid-19 affected mothers. The early identification of covid-19 infection in infants and children had important effects on its management and curbing the infection in the general population. [4]

Laboratory investigation done in covid-19 positive children revealed that MIS-C has far more elevated biochemical and hematological parameters like CRP (C–reactive protein), D-dimer, ferritin, elevated cardiac enzymes, and low lymphocyte count in CBC (complete blood count). The complications of this syndrome include multi-organ failure, thrombosis, ischemic events, and coronary aneurysms; unlike adults, children rarely have comorbidities such as hypertension, cardiovascular disease, and diabetes. [5, 6]

The main reported risk factors for the pediatric population to be infected with covid-19 were close contact with covid-19 infected family members and a history of travel or residence in an endemic area. [7] Studies have suggested that younger children are more likely to transmit SARS-CoV-

2 infection compared to older children, and the highest odds of transmission were observed for children aged 0-3 years. Differential infectivity of pediatric age groups has implications for infection prevention controls within households, as well as schools/childcare, to minimize the risk of household secondary transmission. Differences in viral shedding, symptom expression, and behavioral factors may explain differences in the odds of household transmission for pediatric age groups across studies. Viral load is suspected to be an important factor affecting SARS-CoV-2 transmission. [8]

The clinical characterization of covid-19 varies from mild to severe. In the initial phases of the disease, symptoms like fever, cough, and dyspnea can occur. The severity and outcome of covid-19 vary with age. Previous studies have shown that the pediatric population suffered from mild covid-19 symptoms with low mortality rates. [9, 10] So the present study was carried out to assess the clinical presentation and laboratory derangement of pediatric covid-19 patients admitted to the tertiary care hospital in south India.

MATERIALS AND METHODS:

This retrospective time-bound study was started after the approval of the Institutional Ethics Committee of our institution. The study is registered in the Clinical Trial Registry of India (CTRI/2021/06/034303). Clinical (Sp02, final diagnosis, and outcome) and biochemical parameters (Complete Blood Count, Liver Function Test, Renal Function Test, Lactate De-Hydrogenase, D-dimer, C-Reactive Protein, and Serum ferritin) of pediatric Covid-19 patients were collected from central laboratory and medical record department of our institution. Patient details were anonymized and data were collected and analyzed.

Study Population: Pediatric covid-19 patients (up to 14years of age) who are admitted to our institution from 22^{nd} June 2020 to 22^{nd} July 2020 of any gender having all the required details like laboratory parameters in their case file and central laboratory database were included in this study. A total of 16 pediatric COVID-19 patient details were collected.

Statistical analysis: To analyze the data, descriptive statistical methods were used. Descriptive methods such as frequency and percentage were calculated for categorical data. Mean values were calculated to summarize all laboratory parameters. Analysis was performed using SPSS –version 23 was used.

RESULTS:

The demographic details of pediatric covid-19 patients are shown inTable 1 . Out of 16 patients, 09 (56.2%) were female, and the remaining 07 (43.7%) were male. Out of 16, 05 patients had mild covid, 07 were moderate and the remaining 04 suffered from severe covid-19 infection.

Details	Description
Gender	Female: 9 (56.2%) Male: 7 (43.7%)
Age	0-14 years
Severity of COVID	Mild: 05 (31.2%) Moderate: 07 (43.7%) Severe: 04 (25%)

Table 1: Demographic details of pediatric COVID-19 patients

Parameters	Mean value	Normal range
Erythrocyte Sedimentation Rate (ESR)	14.3	0 to 20mm/1hr
Blood Urea	17.9 mg/dl	19-43mg/dl
Serum Creatinine	0.4 mg/dl	0.62-1.1mg/dl
Total bilirubin	1.7mg/dl	0-2mg/dl
Direct bilirubin	0.2mg/dl	0-0.2mg/dl
Indirect bilirubin	1.5mg/dl	0-1.1mg/dl
SGOT	82.4 U/L	0-31 U/L
SGPT	55 U/L	0-34 U/L
Alkaline phosphatase	135.6 U/L	60-170U/L
Total serum protein	6.8gm/dl,	6.3-8.2gm/dl
Serum albumin	3.8 gm/dl	3.2-4.4gm/dl
Serum globulin	3.01 gm/dl	2.5-3.5gm/dl
Albumin/Globulin ratio	1.2	1.2-1.5

Table 2: Variations in the baseline biochemical parameters of pediatric COVID-19 patients

The mean values of various biochemical parameters are mentioned in table 2. The mean values of oxygen saturation, LDH, D-dimer, CRP, and Ferritin were 88%, 249.4U/L, 1140.9 ng/ml, 16.17 mg/dl, and 61.7 μg/L respectively. With respect to complete blood count, average values of 11.4G, 8.7 x $10^3/\mu$l, 26.7%, 6.8%, 1%, 65.04%, 0.48%, 261.7 x $10^3/\mu$l, and 14.3 respectively noted for hemoglobin, total count, differential counts of lymphocyte, monocyte, eosinophil, neutrophil, basophil, total platelets, and ESR. The mean values of 17.9 mg/dl and 0.4 mg/dl were recorded for blood urea and S.creatinine. Regarding liver function tests, mean values of 1.7mg/dl, 0.2mg/dl, 1.5mg/dl, 82.4

Parameters	Mean value	Normal range
Oxygen saturation (SpO2)	88%	98-100%
C-Reactive Protein (CRP)	16.17mg/dl	0 to 5 mg/L
D-dimer:	1140.9ng/ml	<500ng/ml
Ferritin	61.7μg/L	6.24 - 137μg/L
Lactate De-Hydrogenase (LDH)	249.4U/L	120-246U/L
Hemoglobin (Hb%)	11.4 G	12 to 15gm/dl
Total Leucocyte count	8.7 x $10^3/\mu$l	4-11x$10^3/\mu$L
Differential lymphocyte count	26.7%	25 to 40%
Differential monocyte count	6.8%	1 to 10 %
Differential eosinophil count	1%	1 to 6 %
Differential neutrophil count	65.04%	40 to 75 %
Differential basophil count	0.48%	0 to 1 %
Total platelets	261.7 x $10^3/\mu$l	150 to 450 x $10^3/\mu$L

Table 3: Variations in the other baseline biochemical parameters of pediatric COVID-19 patients

U/L, 55 U/L, 135.6 U/L respectively noted for total bilirubin, direct bilirubin, indirect bilirubin, SGOT, SGPT, and ALP. Mean values of total protein, albumin, globulin, and A/G ratio were found to be 6.8gm/dl, 3.8 gm/dl, 3.01gm/dl, and 1.2 respectively. Regarding patient outcomes, all the patients were recovered and discharged from the hospital.The values are as shown in Tables 2 and 3

DISCUSSION:

Our study was focused on the clinical profile and laboratory derangement covid-19 infection among the pediatric age group admitted to tertiary care hospital in south India. Covid-19 infection presented with multi-organ dysfunction syndrome in children in various parts of the world and it has been a severe respiratory infection and many children and adolescents age group has succumbed to the infection. In this study, we observed that the inflammatory marker like D-dimer was moderately elevated whereas other inflammatory markers like ferritin and C-reactive protein were slightly raised. Liver function tests showed moderate elevation in liver enzymes and renal functions were found to be unaltered in the majority of the study participants. Hematological parameters showed no significant changes among the pediatric patients with no mortality among our study participants.

Similar to our study results Olivia V Swann et al. have found that children and young people have less severe acute covid-19 than adults and they have identified a systemic mucocutaneous-enteric symptom cluster across the whole cohort. [11]Another study by Adebayo Adeyinka et al. on covid-19 infection has mentioned that affected children did not have same the degree of severity of illness as seen in adults. [12]

One of the early reports by Lara S. Shekerdemian et al. described the burden of covid-19 infection in North American PICUs and confirms that severe illness in children is significant but far less frequent than in adults and prehospital comorbidities appear to be an important factor in children. These preliminary observations provide an important platform for larger and more extensive studies of children with covid-19 infection. [13]

Our study results match with another study by Naira M et al. in which they mentioned that childhood covid-19 disease usually runs a mild course. The children can be asymptomatic or present with cough, fever, and fatigue and can have a low-grade fever or even no fever at all which is usually accompanied by upper respiratory tract symptoms like nasal congestion and headache. The disease has a good prognosis in children with most of the cases recovered after a mild disease course and it is very uncommon to progress to severe lower respiratory disease. [14]

CONCLUSION:

The current study has found an increase in laboratory mean values of liver function tests but the mean values of C-reactive protein, LDH, and d-dimer which are the acute inflammatory markers are highly disrupted compared to normal ranges. However, the disease course is less severe with no mortality among children.

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