Clinical spectrum and short-term outcome of post-COVID multisystem inflammatory syndrome in children after the 2019 pandemic: a longitudinal cohort study [version 1; peer review: awaiting peer review]

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First published: 11 Nov 2022, 11:1293
https://doi.org/10.12688/f1000research.127200.1

Abstract

Background
As a post-COVID complication in children, multisystem inflammatory syndrome in children (MIS-C) is important because of its varied and life-threatening manifestations. With this background, this study attempts to focus on MIS-C cases in an underprivileged rural setting in north-eastern India, with most patients being treated with methylprednisolone rather than intravenous immunoglobulin due to financial constraints.

Methods
In this prospective longitudinal cohort study at MGM Medical College, 27 MIS-C cases diagnosed following WHO criteria were included. Laboratory and radiological investigations, including echocardiography, were performed as required for diagnosis and to assess prognosis. Most patients were treated with methylprednisolone. A follow-up assessment was done six weeks after discharge for any residual impairment.

Results
The most frequently affected age group was 5–10 years (59.28%), while respiratory (48.14%) and cardiac (40.74%) were the most commonly involved systems. Logistic regression studies established a significant association between serum ferritin level and prolonged hospital stay (coefficient 0.0674, p=0.0041), possibly due to greater complications in cases with high ferritin levels. Organ impairment was found to increase the need for inotrope use (coefficient 3.8797, p=0.00584). Most cases were treated with methylprednisolone alone (85.18%) with a favourable response and no death occurred.

Conclusion
The favourable response in cases treated with methylprednisolone
only affirms the effectiveness of the drug as a cheaper alternative in a resource-poor setting. The study highlights that higher ferritin levels in complicated cases leads to prolonged hospitalisation and the increased need for inotropes in cases with organ impairment.

**Keywords**
Ferritin; Methylprednisolone; MODS; SARS-COV-2 infection

This article is included in the Emerging Diseases and Outbreaks gateway.

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Author roles: **Kumar S**: Conceptualization, Data Curation, Formal Analysis, Methodology, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Bhattacharya P**: Data Curation, Formal Analysis, Methodology, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Arya N**: Data Curation; **Kumari A**: Writing – Original Draft Preparation, Writing – Review & Editing; **Chattopadhyay N**: Conceptualization, Methodology, Supervision, Validation, Visualization, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

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First published: 11 Nov 2022, 11:1293 https://doi.org/10.12688/f1000research.127200.1
Introduction

Studies on COVID-19-related complications in children were first reported in April 2020 when healthy children presented with either cardiogenic shock or a Kawasaki disease (KD)-like condition associated with severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) infection.1–3 Subsequently, the World Health Organization (WHO) and Center for Disease Control and Prevention (CDC) proposed a case definition for multisystem inflammatory syndrome in children (MIS-C).4–6 MIS-C occurs due to dysregulation of the innate immune system 4–6 weeks following severe acute respiratory syndrome (SARS) infection.7–9 The clinical spectrum varies from mild disease to multi-organ dysfunction syndrome (MODS) which leads to death.10–12 In the largest case series of MIS-C from the USA, the mortality rate was 2%.13 Coronary artery abnormalities developed in 8–24% of cases.14 Most cases were treated with either intravenous immunoglobulin (IVIG) alone or along with methylprednisolone (MP).15,16 As in many other bacterial and viral infections, serum ferritin levels were significantly raised in COVID and post-COVID, along with other inflammatory mediators including tumour necrosis factor alpha (TNFa), interleukin-1 (IL-1), interleukin-8 (IL-8), and type I interferon (IFN). Ferritin plays a crucial role in decreasing iron availability, intracellular sequestration, taming inflammatory reactions, and protecting host cells from oxidative damage.

The affordability of IVIG is an issue in this remote, underprivileged area in North-Eastern India, prompting us to perform this study with the objectives to study the different clinical presentations across age groups, immediate and short-term outcomes and parameters associated with disease severity.

Methods

Study design and setting
This was a prospective longitudinal cohort study conducted at MGM Medical College and LSK Hospital, Bihar, India. From 1st June 2021 to 30th April 2022, the study included recruitment, follow-up, and data collection. Informed consent was taken from participant attendants and ethical clearance was obtained by Ethical committee of institute. IEC No. MGM/PRI-880/22.

Study population
Children up to the age of 18 years admitted to MGM Medical College & Hospital with a clinical diagnosis of MIS-C, in accordance with the WHO criteria, were included in the study.17 Infections including dengue, scrub typhus, and bacterial sepsis and active covid infection (diagnosed by nasopharyngeal rapid antigen test) were excluded by appropriate investigations. COVID-19 antibody IgG and IgM qualitative testing was done in all cases (method: Enzyme Linked Fluorescent Assay Technique on instrument of the VIDAS family). Data collection was done by trained resident doctors in a preformed abstraction form during the hospital stay and on follow-up after six weeks of discharge.

Procedure
A detailed clinical history and examination were conducted to determine precipitating factors for the illness and reach a clinical diagnosis. Necessary investigations for the diagnosis of MIS-C and evaluation of organ impairment at the time of discharge & follow-up were conducted. Laboratory markers including erythrocyte sedimentation rate, C-reactive protein, neutrophil/lymphocyte ratio, serum ferritin, D-dimer, liver and renal function tests, prothrombin time, and activated partial thromboplastin time (APTT) were done at the time of admission before starting immune-modulator therapy. Creatinine phosphokinase (CPK-MB) and troponin-1 were not included as they were not done routinely at this hospital. Chest X-rays, high-resolution chest computed tomography (CT) scans, electrocardiogram (ECG), and echocardiography were performed where indicated at the time of admission and at the time of follow-up. After six weeks, the children were reassessed with a clinical evaluation and lab tests.

Operational definitions
Demographics, clinical signs and symptoms, laboratory parameters, echocardiography, and coronary findings (at admission and at six-week follow-up), duration of ICU stay, medication (with special emphasis on immunomodulators and inotropes), mechanical ventilation, and mortality were all collected using a pre-designed proforma.

The choice of immunomodulators for treatment was decided by the treating team based on affordability for the patient and guidelines for the management of COVID-19 provided by the Ministry of Health and Family Welfare, Government of India.18 Echocardiography was done in all patients with shock at admission and again six weeks after discharge in case of residual cardiac impairment. Left ventricular ejection fraction (LVEF), coronary artery abnormality with a Z-score of >2.5, and other features like myocarditis, dilated cardiomyopathy, pericardial effusion, and arrhythmia were assessed.19 A person was thought to be in shock if they needed more than 20 mL/kg of IV fluid or an inotrope to keep their blood pressure above the 5th centile.
Patients who were treated with methylprednisolone received a pulse dose of 30 mg/kg/day for three days, followed by 2 mg/kg/day for a week or until their CRP value normalised. Steroids were tapered off over the next 2–3 weeks. Children treated with IVIG received 2 gm/kg as a continuous infusion over 8–12 hours. Recovery with residual organ impairment was defined on the basis of clinical features and laboratory findings or echocardiographic findings at the time of discharge.

**Categorisation of children with MIS-C**

The patients were categorized into three groups according to age: <5 years, 5–10 years, and >10 years for subgroup comparison. All patients were further categorised based on hospital stay (duration) and organ impairment (fully recovered or partial recovery).

**Sampling method**

Samples were taken using a simple random sampling method technique.

**Sample size**

Based on a 95% confidence interval, a 5% alpha error, and the fact that MIS-C occurs in 2% of cases, the sample size was calculated to be 32 by online Epi Info software.

**Statistical analysis**

We used R software, version 3.4 (RRID:SCR_001905), for statistical analysis. All continuous variables were summarised using the mean (SD) or median (IQR). Categorical variables were expressed in counts (%). Age group and laboratory findings and complication mean were compared by ANOVA test and categorical frequency were compared by Chi squared test. Logistic regression analysis was used to assess the significant association between complications and laboratory findings. P value less than 0.05 was considered significant.

**Results**

**Demographic characteristics**

A total of 42 participants were enrolled in the study, but 10 individuals had active cases of COVID-19 (rapid antigen test positive) and 5 were serologically negative and hence were excluded. Among the 27 patients with confirmed MIS-C, 14 (51.9%) were male and 13 (48.1%) were female. The median age of patients was 8 years (range 2–16 yrs.). The most common age group of MIS-C was 5–10 years (59.28%). Three (11.11%) patients had comorbidities such as cerebral palsy, seizure disorder, and pulmonary tuberculosis. A temporal association with COVID-19 infection was identified with serological testing of COVID-19 IgG and IgM. All patients were serologically IgG positive and four (14.81%) were IgM positive.

**Clinical characteristics**

A fever was present in 26 (96.29%) cases, and one patient was afebrile (Table 1). The most common system involved was the respiratory system, with 13 patients displaying complications of this kind (48.14%). Dyspnea (100%) and cough (38.4%) were the most common symptoms of the respiratory system. Table 1 gives the demographic, clinical characteristics, and the outcome of MIS-C cases across age groups.

The second most common organ involvement was the cardiac system, which was affected in 11 patients (40.74%). Shock and hypotension were noted in all cases and one patient suffered from cardiac arrhythmia in the form of sinus tachycardia. The incidence of shock was highest in the age group of 5–10 years (81.18%). Mucocutaneous involvement was seen in seven (25.92%) children, among whom a macula-papular rash over the trunk and extremities was evident in six of them (85.71%). Two patients (28.57%) had non-purulent conjunctivitis, and one each had petechia and oropharyngeal congestion. Cervical lymphadenopathy was seen in one child. Seven (25.92%) patients had CNS affection, including six (85.71%) with altered sensorium, four (57.14%) with seizures, and two (28.57%) with headaches. Gastrointestinal involvement was seen in five (18.51%) children, of which diarrhoea was reported in four (80%), followed by abdominal pain in three (60%), and nausea and vomiting in two (40%). Two patients (7.4%) suffered from hepatitis C.

**Laboratory investigations and cardiac assessment**

At the time of admission, anaemia (below 2 standard deviations for age and sex) was found in 14 (51.85%) children. Four (14.8%) had thrombocytopenia (1.5 lakh/mm³) and four (14.8%) had leucopenia (5000 mm³). Among inflammatory markers, C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were raised in all cases, with an average mean value of 15.89 and 25.59, respectively. Serum ferritin (mean value of 942.04 ng/mL) and dimer (3255 ng/mL) levels were also raised in all cases. Prothrombin time/activated partial thromboplastin time (PT/APTT) was abnormal in two (7.4%) cases and transaminase values were raised in three (11.11%) patients (Table 2).
<table>
<thead>
<tr>
<th></th>
<th>Total (n=27) No. (%)</th>
<th>&lt;5 years (n=5) No. (%)</th>
<th>5-10 years (n=16) No. (%)</th>
<th>&gt;10 years (n=6) No. (%)</th>
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</thead>
<tbody>
<tr>
<td>1. Sex</td>
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<tr>
<td>Male</td>
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<td>10 (62.5)</td>
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<td>Female</td>
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<td>1 (6.3)</td>
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<td>1 (6.3)</td>
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<td>5 (18.51)</td>
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<td>5 (18.51)</td>
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<td>GI</td>
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<td>1 (20.0)</td>
<td>1 (20.0)</td>
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<td>1 (33.33)</td>
<td>1 (33.33)</td>
<td>1 (33.33)</td>
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<td>Diarrhoea</td>
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<td>3 (75.0)</td>
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<td>2 (18.18)</td>
<td>9 (81.81)</td>
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<td>Shock</td>
<td>11 (100.0)</td>
<td>2 (18.18)</td>
<td>9 (81.81)</td>
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<tr>
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<td>2 (18.18)</td>
<td>9 (81.81)</td>
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<td>Respiratory</td>
<td>13 (48.14)</td>
<td>2 (15.3)</td>
<td>9 (69.23)</td>
<td>2 (15.3)</td>
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<td>Dyspnoea</td>
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<td>3 (23.07)</td>
<td>8 (61.53)</td>
<td>2 (15.3)</td>
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<tr>
<td>Cough</td>
<td>5 (38.46)</td>
<td>1 (20.0)</td>
<td>2 (40.0)</td>
<td>2 (40.0)</td>
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<td>Mucocutaneous</td>
<td>7 (25.9)</td>
<td>1 (14.28)</td>
<td>4 (57.12)</td>
<td>2 (28.57)</td>
</tr>
<tr>
<td>Rash</td>
<td>6 (85.71)</td>
<td>1 (16.6)</td>
<td>4 (66.6)</td>
<td>1 (16.6)</td>
</tr>
<tr>
<td>Lymph node</td>
<td>1 (14.28)</td>
<td>1 (100.0)</td>
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<td></td>
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<tr>
<td>Petechiae</td>
<td>1 (14.28)</td>
<td>1 (100)</td>
<td></td>
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<tr>
<td>Conjunctivitis</td>
<td>2 (28.57)</td>
<td>1 (50)</td>
<td>1 (50)</td>
<td></td>
</tr>
<tr>
<td>Oropharyngeal</td>
<td>1 (14.28)</td>
<td>1 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNS</td>
<td>7 (25.92)</td>
<td>1 (14.28)</td>
<td>4 (57.14)</td>
<td>2 (28.57)</td>
</tr>
<tr>
<td>Seizure</td>
<td>4 (57.14)</td>
<td>1 (25)</td>
<td>2 (50)</td>
<td>1 (25)</td>
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<tr>
<td>Altered sensorium</td>
<td>6 (85.71)</td>
<td>1 (16.66)</td>
<td>4 (66.66)</td>
<td>1 (16.66)</td>
</tr>
<tr>
<td>Headache</td>
<td>2 (33.3)</td>
<td>1 (50)</td>
<td>1 (50)</td>
<td></td>
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<tr>
<td>Hepatitis</td>
<td>2 (7.40)</td>
<td>2 (100.0)</td>
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<td>5. Treatment</td>
<td></td>
<td></td>
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<tr>
<td>Inotropes</td>
<td>11 (45.83)</td>
<td>2 (1.1)</td>
<td>9 (81.8)</td>
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<tr>
<td>Methyl prednisolone</td>
<td>23 (85.1)</td>
<td>4 (80.0)</td>
<td>13 (81.25)</td>
<td>6 (100.0)</td>
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<tr>
<td>IVIG</td>
<td>4 (14.8)</td>
<td>1 (20.0)</td>
<td>3 (75.0)</td>
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<td>Non-invasive ventilation</td>
<td>16 (59.3)</td>
<td>2 (12.5)</td>
<td>10 (62.5)</td>
<td>4 (25.0)</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>4 (16.66)</td>
<td>0</td>
<td>3 (75.0)</td>
<td>1 (20.0)</td>
</tr>
<tr>
<td>6. Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PICU stay in cases</td>
<td>24 (88.8)</td>
<td>4 (16.6)</td>
<td>15 (62.5)</td>
<td>5 (20.8)</td>
</tr>
<tr>
<td>Duration of PICU stay in days, median (range)</td>
<td>6.5 (2-15)</td>
<td>5.5 (3-7)</td>
<td>6 (2-12)</td>
<td>7 (3-15)</td>
</tr>
<tr>
<td>Duration of hospital stay (days), median (range)</td>
<td>14 (7-34)</td>
<td>12 (7-18)</td>
<td>14.5 (8-34)</td>
<td>14 (7-30)</td>
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</table>
Echocardiography (ECHO) was done in 11 patients in which myocarditis (54.54%), global hypokinesia (18.18%), severely decreased left ventricular ejection fraction (LVEF) less than 30% was 18.18%, moderately decreased LVEF [30–55%] was 45.45%, and one patient pulmonary embolism were noted.

Clinical course, treatment, and outcome
Twenty-four (88.88%) patients required intensive care, and the median duration of PICU stay was 6.5 days (range 2–15). Four patients (16.66%) required mechanical ventilation and 11 (45.83%) required inotropic support.

Twenty-three patients (85.18%) were treated with methylprednisolone, and four (14.8%) patients were treated with IVIG. Of the patients treated with IVIG, one patient had a complete recovery and three had residual organ impairment at the time of discharge (95% CI, 25–75%; p=0.239). One patient who suffered from a pulmonary embolism was given anticoagulant therapy.

At the time of discharge, 14 (51.85%) children had fully recovered, and 13 (48.14%) patients suffered from organ impairment, of which 10 had cardiovascular involvement (76.9%), two had CNS involvement (15.38%), and one had respiratory involvement (7.6%). The average median hospital stay duration was 13.5 days (range 7–34). No patients had expired.

### Table 1. Continued

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Total (n=27) Mean±S.D</th>
<th>&lt;5 years (n=5) Mean±S.D</th>
<th>5-10 years (n=16) Mean±S.D</th>
<th>&gt;10 years (n=6) Mean±S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVS</td>
<td>10 (76.9)</td>
<td>2 (20.0)</td>
<td>8 (80.0)</td>
<td>0</td>
</tr>
<tr>
<td>CNS</td>
<td>2 (16.66)</td>
<td>0</td>
<td>1 (50.0)</td>
<td>1 (50.0)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>1 (3.70)</td>
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<td>0</td>
<td>1 (100.0)</td>
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</table>

### Table 2. Laboratory findings in MIS-C cases.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Total Mean±S.D</th>
<th>&lt;5 years (n=5) Mean±S.D</th>
<th>5-10 years (n=16) Mean±S.D</th>
<th>&gt;10 years (n=6) Mean±S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>IgG</td>
<td>14.58±4.35</td>
<td>5.10±4.42</td>
<td>7.52±8.10</td>
<td>41.29±9.12</td>
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<tr>
<td>IgM</td>
<td>1.28±0.06</td>
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<td>1.56±0.30</td>
<td>1.01±0.98</td>
</tr>
<tr>
<td>TLC (/μL)</td>
<td>10577.4±4409.61</td>
<td>11430.0±2996.581</td>
<td>10455.6±4411.006</td>
<td>10191.6±5882.59</td>
</tr>
<tr>
<td>Platelet</td>
<td>21378.5±7898.97</td>
<td>223018.0±24358.81</td>
<td>210175.0±80868.68</td>
<td>215733.3±110541.33</td>
</tr>
<tr>
<td>N/L Ratio</td>
<td>3.597±2.6518</td>
<td>2.050±1.8894</td>
<td>3.604±2.7426</td>
<td>4.867±2.6113</td>
</tr>
<tr>
<td>CRP (mg/L)</td>
<td>15.89±9.345</td>
<td>15.40±18.434</td>
<td>17.25±6.758</td>
<td>12.67±5.164</td>
</tr>
<tr>
<td>ESR (mm/hr)</td>
<td>25.59±9.443</td>
<td>20.60±4.450</td>
<td>25.38±9.521</td>
<td>30.33±11.130</td>
</tr>
<tr>
<td>Ferritin (ng/mL)</td>
<td>942.04±560.9147</td>
<td>756.20±295.24</td>
<td>1078.00±653.20</td>
<td>747.20±424.14</td>
</tr>
<tr>
<td>D-dimer (ng/mL)</td>
<td>3445.77±3591.86</td>
<td>2482.31±3072.53</td>
<td>3273.23±3457.05</td>
<td>3296.32±3439.86</td>
</tr>
</tbody>
</table>

CRP (c-reactive protein), ESR (erythrocyte sedimentation rate), TLC (total leucocyte count), N/L (neutrophil lymphocyte ratio).

Echocardiography (ECHO) was done in 11 patients in which myocarditis (54.54%), global hypokinesia (18.18%), severely decreased left ventricular ejection fraction (LVEF) less than 30% was 18.18%, moderately decreased LVEF [30–55%] was 45.45%, and one patient pulmonary embolism were noted.

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At the time of discharge, 14 (51.85%) children had fully recovered, and 13 (48.14%) patients suffered from organ impairment, of which 10 had cardiovascular involvement (76.9%), two had CNS involvement (15.38%), and one had respiratory involvement (7.6%). The average median hospital stay duration was 13.5 days (range 7–34). No patients had expired.
Follow-up at six weeks after discharge
All discharged patients remained clinically stable, and no new symptoms or deterioration were noted. In patients with partial recovery, improvement in terms of increased LVEF, Z scores, and respiratory findings was noted. However, hemiparesis and facial palsy persisted in children with CNS involvement. Multiple logistic regression was done to predict the effect of laboratory markers on the likelihood of occurrence of organ impairment and prolongation of hospital stay in which only serum ferritin level \([\text{Coefficient 0.00674; } p = 0.0041]\) was significant for prolongation of hospitalization possibly due to its positive association with greater organ impairment (Tables 3, 4, 5 and Figure 1).

Discussion
The present study shows a favourable outcome in MIS-C treated with methylprednisolone therapy. In this study, the median age was 8 years old and the most common age group was 5–10 years. Fever was a universal symptom (96.29%). The most common systems of involvement were respiratory (48.14%) and cardiac (40.74%). Shock mainly occurred in the age group of 5–10 years. Mucocutaneous involvement occurred in 25.92% of cases and CNS involvement in 25.92% of cases.

In a recent multicentre observational study of 134 cases, Nayak S et al. have shown that fever was a universal finding. In 50.7% and 39.6% of the cases, gastrointestinal and respiratory symptoms were observed, respectively. Shock was
noted in 35% of cases. Sugnan S et al. found that the median age of patients with MIS-C was 7.5 years and the most common symptoms were gastrointestinal (84%) and cardiac (91%). In our study gastrointestinal symptom was not such a common presentation as GI cases with relatively milder symptoms, did not come to the tertiary center and commonest age presentation similar to the study by Sugnan S et al.

Laboratory parameters showed a trend toward lower lymphocytes and a high N/L (neutrophil/lymphocyte) ratio. Inflammatory markers such as CRP, ESR, D-dimer, and serum ferritin were high in all cases in our study population. Lacuna–Rangel found an association with having a high white blood cell count, low lymphocyte count, low platelet count, and elevated CRP with increased mortality and severity of disease. Tiwari Arun et al. showed that inflammatory markers (CRP, ESR, D-dimer, and ferritin) were elevated in all cases. In our study, as in the study by Tiwari et al., these inflammatory markers were elevated.

In our study, cardiac evaluation by echocardiography revealed myocarditis (54.54%) as a prominent finding, which is higher than a Brazilian study which reported myocarditis in only 27% of cases and a Turkish study that found that a 22.4% incidence of myocardial dysfunction in MIS-C may be due to the fact that mostly referral patients were included in the study. Thrombosis was not reported in any Indian study but was observed in our studies, and was also documented in studies conducted in the United States and the United Kingdom.

In our study, 88.88% of cases required intensive care, and the median duration of pediatric intensive care unit (PICU) stay was 6.5 days; 16.66% of PICU patients required MV. In our study, the PICU admission rate was high compared with the subsequently discussed literature due to patients who were critically ill and mostly referred from other hospital.

Nayak S et al. reported that 55.2% of patients required intensive care and the median PICU stay was four days. MV was required in 27.38% of cases and the median stay in a hospital was 8.09 days.

In our study, most patients were treated with methylprednisolone. At the time of discharge, 51.85% had recovered completely and there was no mortality. The remaining 48.15% went home with some residual impairment. In earlier studies, mortality due to MIS-C was reported to be 1.2–2%. Godfred-Cato S et al. reported a favourable short-term outcome response to IVIG and steroids.

In our study multiple logistic regression showed high serum ferritin level was significantly associated with longer duration of hospital stay which is consistent with study of Mercks J et al. Clinically, it was evident that no systemic complications were seen in cases within one week of hospital stay, though in most cases, greater organ impairment was the underlying cause of the prolonged hospital stay. So, it may be inferred that higher ferritin levels were associated with

Figure 1. Incidence of systemic complications related to hospital stay. CVS (cardiovascular system), CNS (central nervous system), RESP (respiratory system).
organ impairment, which led to a prolonged hospital stay. A study by Merck J et al. showed that age and high ferritin were associated with more severe MIS-C.\textsuperscript{29}

In binary logistic regression, another significant finding was that organ impairment necessitated a greater requirement for inotropes.

It is thus observed that our patients, mostly treated with methylprednisolone, had a similar outcome compared with studies from other parts of the country and abroad. In a resource-poor setting, this was an effective and affordable mode of treatment.

**Limitations**

1. Being a tertiary center, only patients in more serious condition were admitted, and hence the overall clinical spectrum of MIS-C may not have been truly reflected in the study population.

2. Due to the small sample size, the results may not be representative of the general population.

**What this study adds to our knowledge**

1. Use of pulse methylprednisolone therapy as a first-line treatment for MIS-C had favourable immediate and short-term outcomes.

2. High serum ferritin levels are associated with severe systemic complications leading to prolonged hospitalisation.

3. Greater organ infliction, as reflected by residual organ impairment, is associated with increased use of inotropes.

**Conclusions**

In patients with MIS-C with severe organ impairment, IV methylprednisolone pulse therapy was associated with favourable immediate and short-term follow-up outcomes. High serum ferritin can predict severe systemic complications and hence prolonged hospitalisation. This study demonstrates that cases with eventual residual organ impairment require greater use of inotropes. Further studies and longer follow-ups of patients diagnosed with MIS-C are required to improve treatment and follow-up criteria.

**Informed consent**

Written informed consent was obtained from the parents of all participants under the age of 18 years old.

**Ethical approval**

Ethical clearance was obtained by the Institutional Ethics Committee. IEC No: MGM/PRI-880/22.

**Data availability**

**Underlying data**

Figshare: MISC. https://doi.org/10.6084/m9.figshare.21523530.v1.\textsuperscript{30}

The project contains the following underlying data:

- MISC Data Entry.xlsx (raw data).
- MISC questionnaire.docx (raw questionnaire).

**Reporting guidelines**


Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CC0 1.0 Public domain dedication).
References

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