

## A case report on Multisystem Inflammatory Syndrome in Children (MIS-C) with myocarditis

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### Abstract

Multisystem Inflammatory Syndrome in Children (MIS-C) is a serious condition that can occur after a SARS-CoV-2 infection, commonly known as COVID-19. It involves fever, organ dysfunction, and increased inflammation markers. It was initially described as a post-infection complication of SARS-CoV-2 virus. With the development of vaccines and the efforts to control the spread of the virus, the incidence of MIS-C has decreased. There is no specific test to diagnosis a patient with this condition For patients with symptoms of MIS-C, clinicians perform a thorough evaluation, which may include blood tests, scans etc. Patients are also tested for the presence of antibodies to SARS-CoV2, the virus that causes COVID-19. When it comes to the treatment of Multisystem Inflammatory Syndrome in Children (MIS-C), it typically involves a multidisciplinary approach and may vary depending on the severity of the condition. Treatment often includes hospitalization for close monitoring and supportive care. This can involve intravenous fluids, medications to reduce inflammation, and management of specific organ complications. In some cases, additional interventions such as immunoglobulin therapy or steroids may be used.

**Keywords:** MIS-C; (Multi-system inflammatory Syndrome in children); COVID-19; SARS-COV-2 (Severe acute respiratory syndrome coronavirus 2); IVIG (Intravenous immune globulin); CRP (C-reactive protein)

### 1. Introduction

Multisystem Inflammatory Syndrome in Children (MIS-C) is indeed a new phenomenon that has been reported worldwide. It is characterized by inflammation in multiple organ systems in children and has been observed to have a temporal association with Covid-19<sup>[2]</sup>. It is a new inflammatory disorder that has emerged during the COVID-19 pandemic. It's a serious condition that can lead to critical illness, with a significant number of patients requiring intensive care. Some of the notable features include LV systolic dysfunction, myocarditis, and the development of coronary artery aneurysms in a small percentage of cases<sup>[3]</sup>. MIS-C presents with various symptoms like fever, rash, conjunctivitis, and gastrointestinal , heart issues, myalgia, chest pain or respiratory distress, lymphadenopathy, myocardial dysfunction, cardiac conduction abnormalities and shock are common features. It's often accompanied by active COVID-19 symptoms. Lab findings show elevated biomarkers for inflammation and coagulopathy. Cardiac problems like coronary aneurysm, myocarditis, and pericardial effusion can also be associated with MIS-C. While the prognosis is generally favourable, the long-term outcomes are still uncertain, and sometimes aggressive management, like ICU admission and mechanical ventilation, may be necessary<sup>[4]</sup>. Majority of affected children with MIS-C responded well to treatment, They were given intravenous immune globulin (IVIG) and some also received high-dose steroids. Most of them show improvement in vital signs and cardiac dysfunction. Some children needs additional therapies, like Anakinra (a recombinant IL-1 $\beta$  antagonist) or a second dose of IVIG<sup>[5]</sup>.

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The exact cause is not well understood, it seems that direct infection from SARS-CoV-2 is less likely to be the main factor. Instead, it's believed that abnormal immune or inflammatory response triggered by the virus plays a significant role. MIS-C typically occurs 2-6 weeks after exposure to SARS-CoV-2, and it involves intense inflammation and a cytokine storm that affects multiple systems in the body. The majority of cases show positive SARS-CoV-2 serology, and immunomodulation has shown promising results in treatment. Several mechanisms, such as antibody-dependent enhancement, T-cell activation, elevated cytokine levels, post-viral myocarditis, inflammatory vasculopathy, and endothelial injury, may contribute to the organ damage seen in MIS-C. Laboratory changes, including neutrophilia, lymphopenia, thrombocytopenia, and elevated inflammatory markers like CRP, ESR, procalcitonin, and various cytokines (IL-1 $\beta$ , IL-6, IL-8, IL-10, IL-17, and IFN- $\gamma$ ), indicate the presence of exaggerated inflammation<sup>[6]</sup>.

## 2. Case report

A 3yrs old male patient was admitted in pediatrics department with complaints of fever on and off for 3 weeks, abdominal pain at epigastric area for 1 day. Patient had a history of COVID-19 infection. On admission the patient was irritable and febrile.

On laboratory investigation the patient Covid IgG was significantly elevated to greater than 200 g/L, D.dimer was elevated to 1532ng/ml, BNP was elevated to 23800pg/ml, Serum LDH was 280U/L, CRP was elevated to 41.7, Troponin-I was elevated to 563pg/ml, ESR was elevated to 35mm/hr, Total count was elevated to 20130cells/cumm. Echo report shows that mild global LV hypokinesia, s/o Myocarditis. Overall fair LV systolic function with mild PAH(pulmonary Arterial Hypertension). USG abdomen and pelvic shows mesenteric lymphadenitis. Peripheral smear shows Dimorphic anemia (normocytic normochromic to microcytic hypochromic) and mild neutrophilic leukocytosis. Based on the symptoms and laboratory investigation the patient was diagnosed as multisystem inflammatory syndrome in children with Myocarditis.

Patient was admitted for 9 days and on medications with Inj Lasix (Furosemide) 10 mg, T. Aldactone (Spironolactone) 25 mg as STAT and treated with , Inj.Monocef ( Ceftriaxone) 600 mg twice daily for 2 days (2 dose), Inj. Pantop (Pantoprazole) 10 mg twice daily for 6 days , Syp. Calpol (Paracetamol) 3.5ml (250 mg) thrice daily for 2 days, Syp. Carmicide ( sodium citrate, citric acid) 5 ml twice daily for 2 days, Econorm sachet once daily for 2 days, Inj. Meropenam 480 mg 8 hrly for 7 days (14 doses), Inj. Teicoplanin 120 mg 12 hrly for 5 days, Z and D drops 2 ml once daily for 5 days, Inj. Methyl prednisolone 120 mg once daily for 5days , Inj. Lasix (furosemide) in 20 ml NS 10 mg once daily for 2 days, Syp.Rantac (Ranitidine) 5 ml once daily for 3 days, Syp. Kidpred (Prednisolone) (5 mg/5 ml) 6 ml twice daily for 3 days, Syp. Zinvovit 2 ml once daily for 2 days. Tab Aspirin 75 mg once daily for 2 days.

After the 9 days of treatment the patient complaints such as fever, abdominal pain, were improved. Hence the patient discharged with the advice of Syp.Omnacortil (Prednisolone) (5 mg/5 ml) 6 ml twice daily for 5 days, followed by 6 ml once daily for next 5 days then followed for 3ml once daily for next 4 days, Tab.Aspirin 75mg (half tablet) once daily for 2 weeks, Syp.Rantac (75 mg/5 ml) 5 ml once daily for 2 weeks, Syp. Zincovit 5 ml once daily for 2 weeks.

## 3. Discussion

In this case report, we describe the cases of MIS-C: The patient had a history of COVID-19 before admission to the PICU and positive antibodies (immunoglobulins, IgG) for COVID-19.The diagnosis was based on the epidemiologic link to COVID-19 infection. It's a condition that can occur in children who have been infected with COVID-19. It involves inflammation in different parts of the body, like heart, lungs, kidneys, and brain. It's important to monitor and treat this condition to ensure the well-being of affected children. The symptoms of MIS-C can vary, but some common ones include persistent fever, rash, red eyes, abdominal pain, vomiting, diarrhoea, and swollen hands and feet.

The management of MIS-C involves a multidisciplinary approach. Children with MIS-C are usually hospitalized and closely monitored. Treatment may include intravenous immunoglobulin (IVIG) and corticosteroids to reduce inflammation. Supportive care is also provided to address specific symptoms and complications.

During hospitalization, doctors will monitor vital signs, organ function, and inflammatory markers. They may also conduct additional tests, such as echocardiograms, to assess the heart's condition. The goal is to stabilize the child's condition, manage any complications.

#### 4. Conclusion

Multisystem Inflammatory Syndrome in Children (MIS-C) is a rare condition that can happen after a child had COVID-19. It causes inflammation in different parts of the body, like heart, lungs, and other organ.

Some common symptoms include persistent fever, abdominal pain, vomiting, diarrhea, rash, red eyes, swollen hands or feet, and difficulty breathing. To diagnose Multisystem Inflammatory Syndrome in Children (MIS-C), doctors typically consider a combination of factors like child's medical history, conduct a physical examination, and other various tests. These tests may include blood tests, imaging studies, and evaluations of organ function. The diagnosis is based on specific criteria established by medical experts.

The treatment of Multisystem Inflammatory Syndrome in Children (MIS-C) generally focused on managing the inflammation and supporting the affected organs. Treatment may involve hospitalization, that includes medications like intravenous immunoglobulin (IVIG) and corticosteroids to reduce inflammation. Other treatments, such as supportive care for specific organ involvement, may also be provided.

#### Compliance with ethical standards

##### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

##### *Statement of informed consent*

Informed consent was obtained from the particular individual participant in the study.

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