

## Dexamethasone Pulse Therapy with Multisystem Inflammatory Syndrome in Children: Case Series

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### Abstract

**Objective:** Study aimed to describe the effect of dexamethasone pulse therapy by assessing its efficacy on patients infected with COVID-19 complicated with MIS-C. **Methods:** This is single center, retrospective case series study that was conducted in Saudi Arabia. We report all eligible patients who diagnosed with MIS-C and received pulse therapy of dexamethasone during COVID-19 pandemic from 2020-2022. The study endpoints were success to wean or extubate the patient and discharge from the PICU. **Results:** Three patients were included in this report. All three patients received dexamethasone pulse therapy were successfully improved. After five to seven days were discharged from PICU. **Conclusion:** Our clinical experience suggests that the efficacy of dexamethasone with MIS-C as alternative to methylprednisolone could be effective.

**Keywords:** Dexamethasone, COVID-19, MIS-C, Case series.

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### INTRODUCTION

Multisystem inflammatory syndrome in children (MIS-C) is a newly explored of hyperinflammatory condition. It has been noted among children who infected with severe acute respiratory syndrome-related coronavirus 2 (SARS-COV-2) or exposed. It demonstrates many clinical features that appeared with Kawasaki disease (KD) and toxic shock syndrome (TSS) as well. Children with confirmed MIS-C presented with fever, systemic illness, shock, cardiac involvement, and multi-organs failure. In the United Kingdom, some parts of Europe, and United States have been recognized it after spreading of SARS-COV-2 in children [1-3]. The mechanism of MIS-C is not clear yet. It shown between peak of starting infected with SARS-COV-2 and few weeks later. Diagnosis confirmed with positive SARS-CoV-2 Immuno globuline (Ig)G but polymerase chain reaction (PCR) negative, and it is known as post-infectious etiology [4, 5]. It is uncontrolled cytokine storm involving hyperinflammatory markers, such as tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), interleukin (IL)-1b, IL-6, and interferon-alfa [6-8]. The main goals to treat MIS-C are to minimize systemic inflammation, and normalize

organ function. Intravenous immunoglobulin (IVIG) has been used as a first-line treatment for MIS-C patients like with KD symptoms. Corticosteroids also have shown strong anti-inflammatory effect to rude cytokine response. Dexamethasone use has been shown to reduce mortality in patients on mechanical ventilation with severe Corona virus-19(COVID-19) infection while in MIS-C patients, IVIG and methylprednisolone were shown faster recovery of cardiac function and shorter stay in critical care units [9-12]. Recent guidelines of Rheumatology Committees suggest using high-dose of steroids which called Pulse Therapy for a duration of 1– 3 days in MIS-C patients with shock, dose was based on methylprednisolone 10 mg/kg Intravenous (IV) daily (max 1 g/day), and dose can be increased to 30 mg/kg daily [13-16]. Most of studies that focused on effect of corticosteroids in MIS-C patients was shown the benefit of only methylprednisolone while other not clear and during COVID-19 pandemic, there was global issue with shortage supply of methylprednisolone leading to use alternatives such as dexamethasone. Dexamethasone pulse therapy has been used for different clinical cases with good results, less cost as compared to methylprednisolone, and with dose of 4-5 mg/kg IV

(max dose 100-200 mg) per pulse daily [17-25]. Our study present case series to assess efficacy of pulse therapy of Dexamethasone with MIS-C patients at major tertiary hospital in Saudi Arabia.

## METHOD

This is single center case series report that conducted in Prince Sultan military Medical City (PSMMC). Study includes all eligible patients who diagnosed with MIS-C and received pulse therapy of dexamethasone during COVID-19 pandemic from 2020-2022. Treatment outcomes were assessed for all patients and were defined based on ability to wean from ventilator support if present, and reduce length of hospital admission. The Institutional Review Board of PSMMC reviewed and approved the study.

## RESULTS

Total of 13 patients who confirmed diagnosis with COVID-19 complicated with MIS-C, three patients were receiving dexamethasone pulse therapy 4mg/kg/day for five days. A outline of their demographic and clinical characteristics is demonstrated below.

### Case 1

This is four years old not known to have chronic illness with history of meningitis eight months prior to presentation. Came with seven days history of upper respiratory tract infection (URTI) symptoms with fever and screened for COVID19 and came positive. Family noticed behavioral changes with altered level of consciences and they sought medical advice after that. Patient was admitted to pediatric intensive care unit (PICU) as a case of COVID-19 complicated with MIS-

C based on finding, patient intubated initially and treated on IVIG with dexamethasone as 4 mg/kg with significant improvement in labs values, clinical situation and brain imaging were within normal. Patient was extubated and discharged from PICU seven days after management, Table 1.

### Case 2

This is five months old medically free came with history of persistent fever for one week and URTI symptoms associated with skin rash. Patient had history of contact with COVID19 positive patient. Echocardiogram (Echo) was done showed coronary artery aneurysm and patient was diagnosed as COVID19 positive associated with MIS-C. Treated with IVIG and dexamethasone 4 mg/kg and received anakira as well. Patient was improved after that and discharged on enoxaparin and aspirin with cardiology follow up, Table 1.

### Case 3

This is nine years old boy, known case of comorbidities, severe hypoxic ischemic encephalopathy, intractable epilepsy, global developmental delay, cortical blindness, spastic quadriplegic cerebral palsy, on tracheostomy and gastrostomy, and totally dependent on his family for all life needs which required close observation by them. Admitted to PICU as case of provoked seizure likely due to pneumonia caused by COVID19 and complicated with MIS-C. Patient initially started on IVIG with no improvement then dexamethasone 4 mg/kg added and patient started to improve after that. And discharged from PICU five days after with no respiratory support apart from tracheal mask oxygen, Table 1.

**Table 1: Summary of the patients' characteristics and outcomes following Dexamethasone pulse therapy administration**

Characteristics	Case 1	Case 2	Case 3
Age	4 years	5 months	9 years
Ferritin (mg/l)	1819 > 319	396 > 101	427 > 125
D-dimer (ng/ml)	20000 > 6940	4900 > 740	1000 > 200
C-reactive protein (CRP) (mg/l)	100 > 8.79	100 > 0.70	44.5 > 3.7

## DISCUSSION

We report a case series of COVID-19 related to MIS-C effectively treated with dexamethasone pulse therapy. Systemic corticosteroids methylprednisolone considered as second-line treatment in the case of failed response of IVIG (24 hours) with MIS-C patients. Our patients received dexamethasone high dose equivalent to 30 mg/ kg/day of methylprednisolone due to zero stock during COVID-19 pandemic. However, it shown good improvement and fast recovery of the patients. Pedro Taffarel *et al.* study demonstrate the efficacy of dexamethasone with MIS-C patients but with lower dose 0.15mg/kg/day in two critically ill patients [26]. The present study shown short-term outcomes of

patients with MIS-C patients in acute phase successfully treated with dexamethasone pulse therapy while for the long term still unknown. Nevertheless, the optimal treatment of MIS-C as yet unknown. D. Sofia Villacis-Nunez *et al.* study showed that corticosteroid whether methylprednisolone or dexamethasone is a sensible management choice for some patients with MIS-C, especially those with mild disease [27]. In our case series report, the aggressive therapy with high dose of dexamethasone might be due to avoiding risks of complications of COVID-19 such as macrophage activation syndrome or hemophagocytic lymphohistiocytosis which are life threatening syndromes in particular during pandemic and the approved treatment was still unknown. Also it was under close

monitoring of PICU team in case of side effects. However, the three patients were successfully discharged in stable condition within few days.

## CONCLUSION

Dexamethsone pulse therapy shown good alternative choice of methylprednisolone in case of sever MIS-C in weaning of respiratory support and length of PICU stay. Further studies are needed in large sample size, strong methodology design and multicenters.

### Author Contributions

Abdullah Alabood and Abdulaziz Alolayan prepared the plan of the study and wrote the manuscript. Huda Zarie and Huda Aldossari supervised the design and execution. Saleh Alharbi and Taleb Alanazi provided preliminary data analysis. Miznah Alotaibi provided final data collection.

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