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Multisystem Inflammatory Syndrome in Children – Characteristics, Therapies, and Outcomes

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Background

Multisystem Inflammatory Syndrome in Children (MIS-C) is a condition characterized by severe systemic inflammation and shock, presenting approximately 4-6 weeks following infection with SARS-CoV-2¹. This emerging disease is identified by the presence of prolonged fever, elevated inflammatory markers, involvement of several organ systems, and evidence of recent COVID-19 infection in pediatric patients². The risk factors for developing MIS-C as well as the long-term outcomes for patients with MIS-C are still unclear.

Objectives

- Identify demographic trends to better predict who is at risk of developing MIS-C following SARS-CoV-2 infection
- Identify symptoms, complications, and effective treatment methods
- Describe the longitudinal cardiac findings in MIS-C

Methods

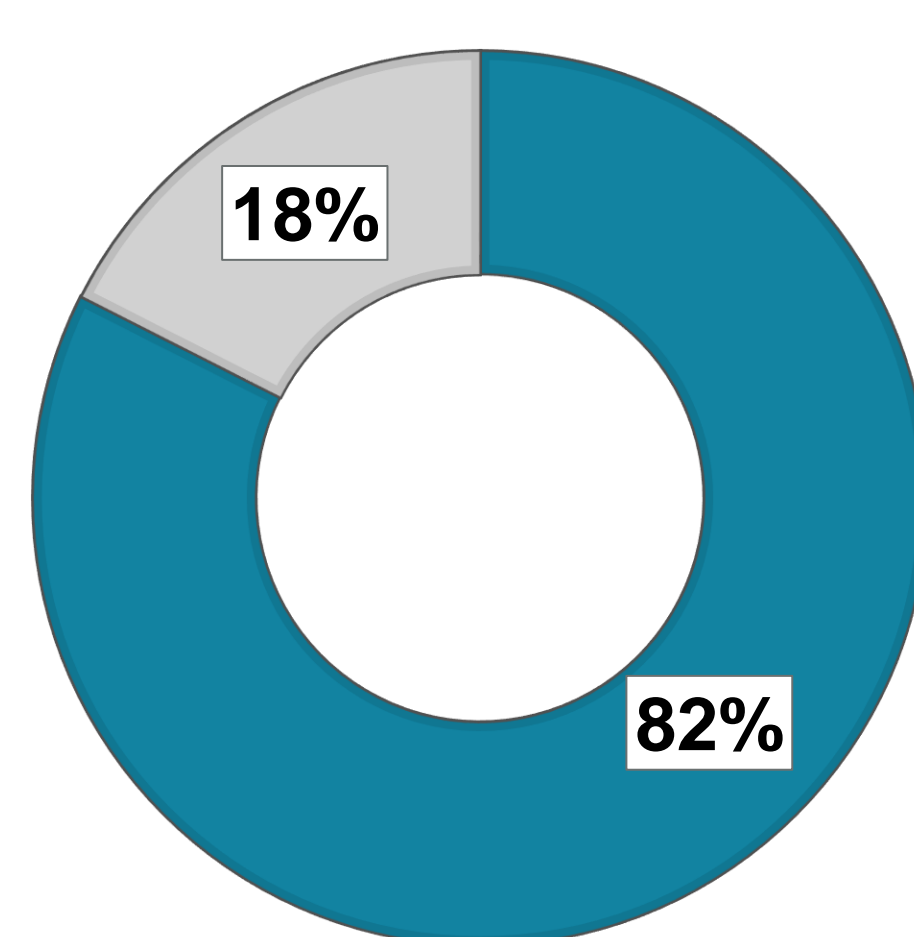
We performed a single-center retrospective cohort study of pediatric patients <21 years of age who presented with MIS-C between April 2020 and June 2021. A variety of data was collected on these patients, including:

- Demographics such as age, gender, race & ethnicity
- Existing comorbidities
- Clinical course
- Lab values and scans
- Medications and treatments
- Patient outcomes following hospital discharge, up to 1 year

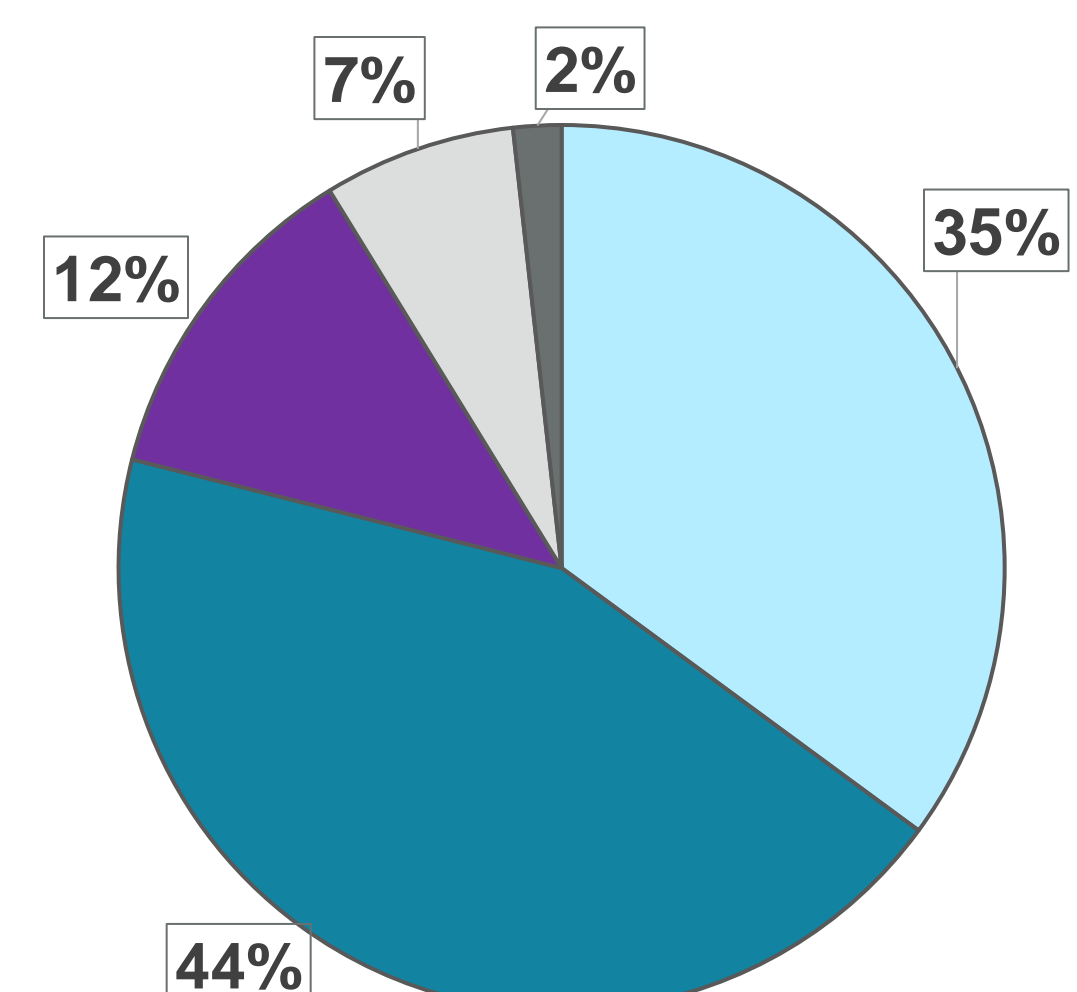
The data was analyzed to identify significant trends in patient type, disease presentation, and outcome. The data was also entered into a secure shared database to be used in further study through the IKDR and the NIH PreVAIL klds program³.

Results

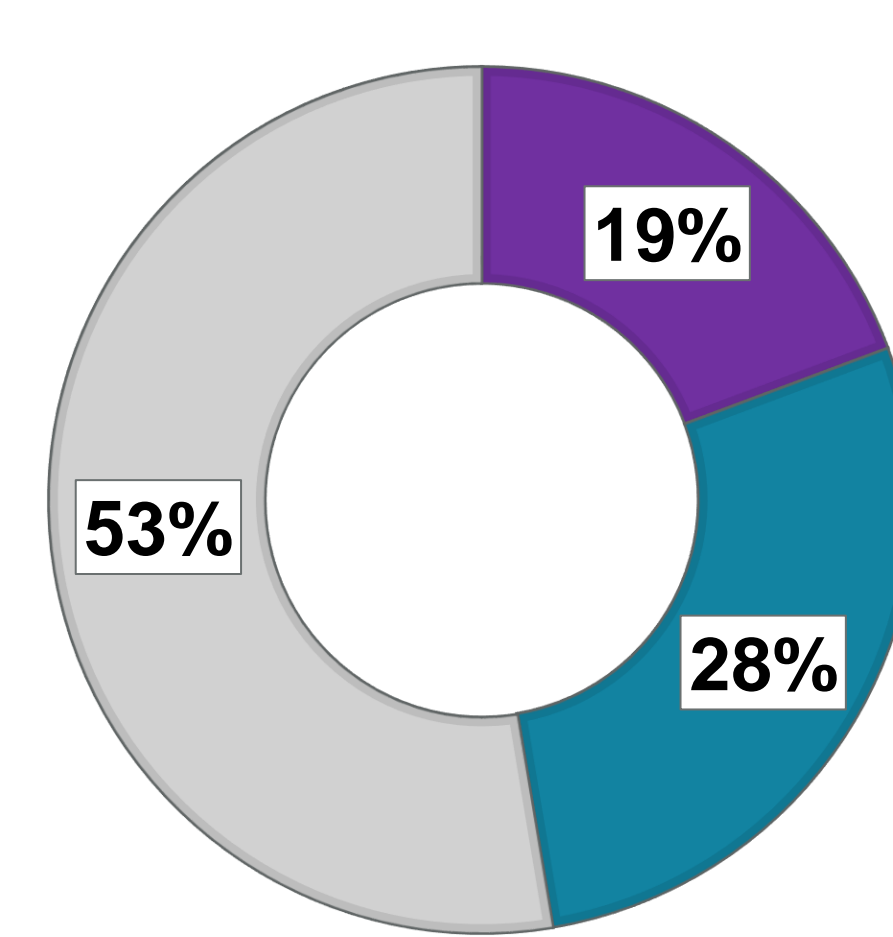
GENDER BREAKDOWN



RACE/ETHNICITY BREAKDOWN



WEIGHT DISTRIBUTION



■ Male ■ Female

■ White ■ Black ■ Arabic/Middle Eastern ■ Hispanic or Latino ■ Asian

■ Overweight ■ Obese ■ Normal Weight

Results

	Median (Min – Max)	Normal Laboratory Values
Troponin-I (mg/mL)	0.048 (0.013 - 67.4)	< 0.013 mg/mL
Pro-BNP (pg/mL)	4510 (22 - 28000)	< 391 pg/mL
ESR	63 (10 - 120)	< 15 mm/hr
C-reactive protein	148 (18.5 - 270)	< 0.7 mg/dL
D-dimer	4274 (534 - 35709)	< 500 ng/mL
Fibrinogen	502 (213 - 1000)	< 335 mg/dL
Ferritin	356.5 (69- 5677)	< 300 ng/mL
Sodium	132 (118 - 139)	> 134 mmol/L
Patients with abnormal Troponin-I – n (%)	39 (68.4)	-
Patients with abnormal pro-BNP – n (%)	49 (86)	-
Patients with AKI* - n (%)	17 (29.8)	-

pro-BNP, pro-brain natriuretic peptide; ESR, erythrocyte sedimentation rate; AKI, acute kidney injury
*AKI is determined by doubling of creatinine values during hospital course

IVIg – n (%)	55 (96)
1 dose	23 (40)
≥ doses	32 (56)
Antiplatelets	53 (93)
Anticoagulants	55 (96)
IV steroid	41 (72)
Oral steroid	39 (68)
IL blockers	10 (18)
Inotropes	17 (30)
Epinephrine	11 (19)
Norepinephrine	16 (28)
Vasopressin	1 (2)

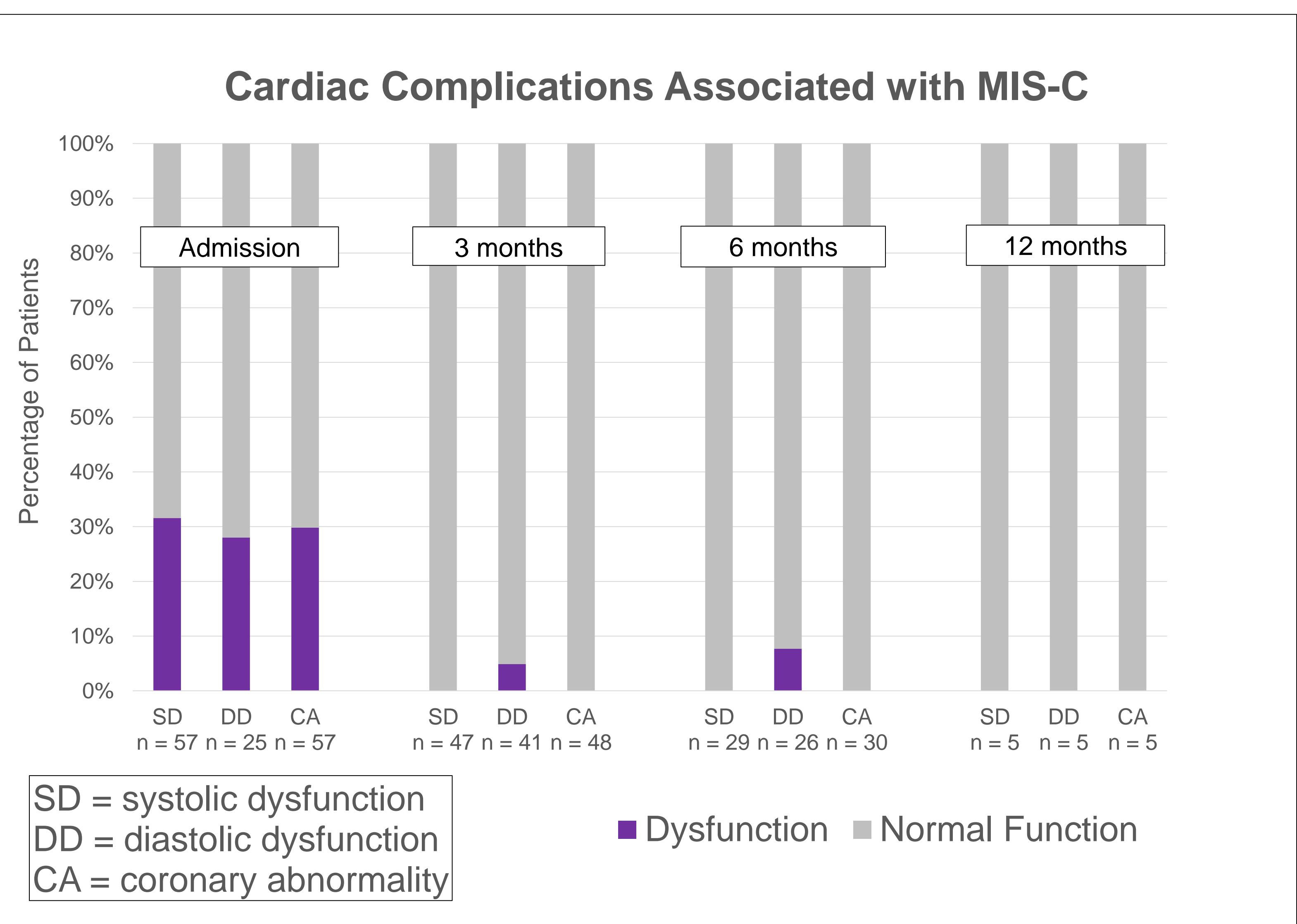
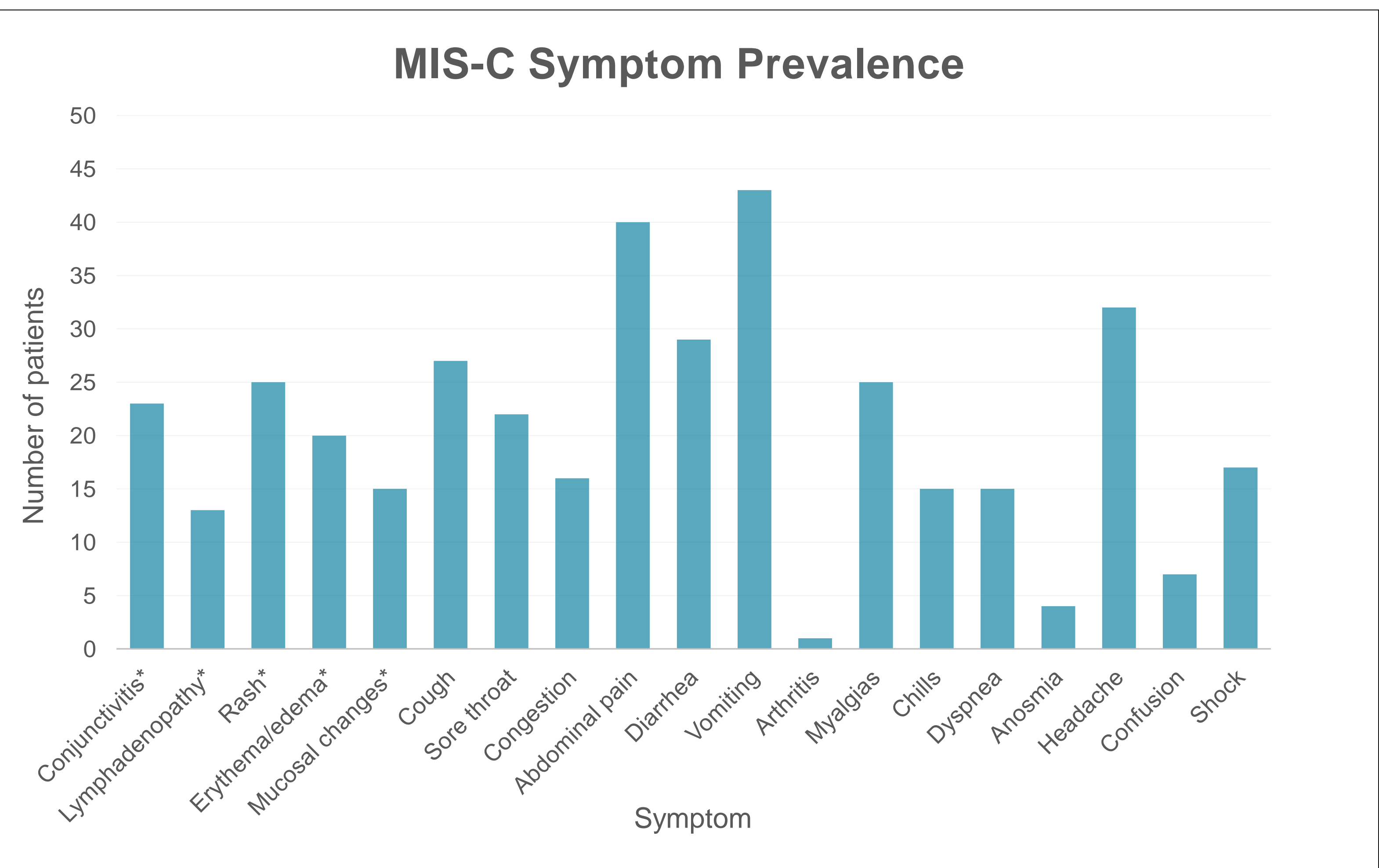
IVIg, Intravenous Immunoglobulin
Antiplatelets = aspirin, IV steroid = methylprednisolone,
Oral steroid = prednisolone, IL blocker = Anakinra

Length of hospital stay (days) - median (r,stdev)	5 (3-22,12)
ICU admission* - n (%)	26 (46)
Length of ICU stay (days) – avg. (range)	5.5 (1-10)
Respiratory dysfunction – moderate or severe	18 (32)
Supplemental oxygen – n (%)	9 (16)
Mechanical ventilation – n (%)	8 (14)
Extracorporeal membrane oxygenation – n (%)	1 (1.7)
Arrhythmia – n (%)	2 (3.5)
Discharged alive – n (%)	57 (100)

*Includes PICU or CCU admission

Conclusions

- Development of MIS-C is more likely in pediatric patients who are male, Hispanic/Latino, and overweight or obese.
- MIS-C symptoms are myriad but most commonly present as prolonged fever, abdominal pain, and vomiting.
- Key lab values for MIS-C include elevated Troponin-I and pro-BNP, suggesting high prevalence of cardiac involvement.
- The use of IVIG, antiplatelets, and anticoagulants may decrease incidence of prolonged coronary dilation, decrease inflammatory markers, and decrease renal dysfunction and presenting symptoms.
- Nearly all cardiac complications associated with MIS-C resolve 3-6 months after discharge.



References

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