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Original Article

Differentiation of MIS-C Cases According to Disease Severity: Early Indicators and Clinical Approaches

MIS-C Şiddetinin Ayırımı: Erken Belirteçler ve Klinik Yaklaşımlar

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ABSTRACT

Objective: This study aims to identify key clinical and laboratory indicators that differentiate between severe and mild presentations of Multisystem Inflammatory Syndrome in Children (MIS-C), facilitating early recognition and application of targeted treatment strategies.

Method: A retrospective, single-center analysis was conducted, reviewing clinical data of patients with MIS-C to identify factors associated with disease severity. The study assessed demographic, clinical, laboratory, and echocardiographic parameters, comparing patients with severe MIS-C (requiring inotropic support or prolonged intensive care unit stay) to those with mild MIS-C. Statistical analyses were performed to determine significant intergroup differences.

Results: The group with severe MIS-C exhibited a longer duration of fever, presence of shock, tachycardia, and hypotension. Inflammatory markers such as lymphopenia, hypoalbuminemia, and elevated ferritin levels were significantly more pronounced in the severe MIS-C group. Elevated N-terminal pro-B-type natriuretic peptide and troponin levels were also significantly associated with severe MIS-C, indicating myocardial involvement. Echocardiographic findings of reduced ejection fraction and valve insufficiency were significant indicators of worsening clinical conditions. Coronavirus disease 2019 polymerase chain reaction and serological tests were not useful in differentiating between severe and mild forms of MIS-C.

Conclusion: Early recognition of clinical features of MIS-C and classification based on disease severity can guide clinicians in diagnosis and treatment of MIS-C. Prolonged fever, shock, elevation of specific inflammatory, and cardiac markers, and echocardiographic abnormalities should raise suspicion for severe disease, prompting rapid intervention and tailored treatment strategies to improve patient outcomes and reduce potential mortality and long-term sequelae.

Keywords: MIS-C, COVID-19, fever, myocarditis, valve insufficiency, hypotension

ÖZ

Amaç: Bu araştırmanın temel hedefi, Multisistem Enflamatuvar Sendromlu çocuklarda (MIS-C) hastalığın şiddetli ve hafif formlarını birbirinden ayırmayı sağlayacak önemli klinik ve laboratuvar göstergelerini belirleyerek erken teşhis ve kişiselleştirilmiş tedavi yaklaşımlarının uygulanmasını desteklemektir.

Yöntem: Bu retrospektif, tek merkezli analiz, MIS-C hastalarının klinik verilerini inceleyerek hastalık şiddetiyle ilişkili faktörleri belirlemek amacıyla yapılmıştır. Çalışmada demografik, klinik, laboratuvar ve ekokardiyografik parametreler değerlendirilmiş, şiddetli MIS-C (inotropik destek veya uzun süreli yoğun bakım ünitesi yatışı gerektiren) olan hastalar, hafif MIS-C'li olanlarla karşılaştırılmıştır. Gruplar arasındaki anlamlı farklılıkları belirlemek için istatistiksel analizler yapılmıştır.

Bulgular: Şiddetli MIS-C grubunda daha uzun süren ateş, şok varlığı, taşikardi ve hipotansiyon gözlendi. Lenfopeni, hipoalbüminemi ve yüksek ferritin düzeyleri gibi enflamatuvar belirteçler, şiddetli grupta anlamlı derecede daha belirgindi. Yüksek N-terminal pro-B tipi natriüretik peptid ve troponin düzeyleri de miyokardiyal tutulumu gösteren şiddetli MIS-C ile anlamlı derecede ilişkiliydi. Azalmış ejeksiyon fraksiyonu ve kapak yetersizliği olan ekokardiyografik bulgular, kötüleşen klinik durumların önemli göstergeleriydi. 2019 Koronavirüs hastalığı polimeraz zincir reaksiyonu ve serolojik testleri, şiddetli ve hafif hastalık arasında ayrım yapmak için yararlı değildi.

Sonuç: MIS-C klinik özelliklerinin erken tanınması ve şiddetine göre sınıflandırılması, klinisyenlere tanı ve tedavi süreçlerinde rehberlik edebilir. Uzamış ateş, şok, spesifik enflamatuvar belirteçler, yüksek kardiyak belirteçler ve ekokardiyografik anormallikler şiddetli hastalık şüphesini artırmalı, hızlı müdahale ve hastaların sonuçlarını iyileştirmek, potansiyel mortaliteyi ve uzun dönem sekelleri azaltmak için uyarlanmış tedavi stratejilerini teşvik etmelidir.

Anahtar kelimeler: MIS-C, COVID-19, ateş, miyokardit, kapak yetmezliği, hipotansiyon

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INTRODUCTION

The Coronavirus disease 2019 (COVID-19) pandemic, which emerged in December 2019, has brought with it a series of complications that have profoundly affected healthcare systems worldwide. One such complication is Multisystem Inflammatory Syndrome in Children (MIS-C), a rare but potentially serious condition. Although MIS-C occurs in less than 1% of children who have had COVID-19, the fact that 62% of these cases require intensive care and mortality rates less than 2% underscores the severity and urgency of this syndrome. MIS-C cases, first reported in the United Kingdom in April 2020, have been also reported in many countries in Europe, Canada, the United States, South Africa, and also China, making MIS-C a global health concern. MIS-C presents with a wide variety of clinical features. In some cases, symptoms of Kawasaki disease or incomplete Kawasaki disease are observed, while in the remag cases, it may mimic the clinical picture of toxic shock syndrome which complicates establishment of diagnosis and treatment of MIS-C[1-6].

Although the pathophysiology of MIS-C is not yet fully understood, it is thought that an excessive immune response developed against the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) forms the underlyung etiopathogenesis of this syndrome. MIS-C, which generally emerges between 2 and 6 weeks following a COVID-19 infection, shows similarities to Kawasaki disease, macrophage activation syndrome, and cytokine storm syndrome[3].

During the COVID-19 pandemic, cases of MIS-C have been frequently observed in pediatric emergency departments, where patients often receive their initial diagnosis. Despite negative polymerase chain reaction (PCR) test results, many MIS-C cases show positive antibodies in serology, suggesting a prior COVID-19 infection. Cardiac involvement is a significant finding in MIS-C, linked to systemic post-infectious inflammation, myocarditis, cardiomyopathy, or myocardial ischemia due to coronary aneurysms[1,2].

Even though the incidence of MIS-C cases has shown a downward trend, raising awareness about this potentially serious condition carries vital importance. In terms of establishing diagnosis and administering appropriate treatment modality. Early intervention can help improve outcomes and lower the risk of severe complications. The aim of this study is to evaluate the demographic characteristics, clinical findings, echocardiographic and laboratory findings of patients diagnosed as MIS-C who were referred to the emergency department, in order to differentiate between severe and mild forms of the disease. Evaluation at the time of initial diagnosis will allow for the classification of the disease as mild or severe, influencing the clinician's treatment and clinical approach. A more effective clinical approach has the potential to reduce the mortality and sequelae of MIS-C. In this context, we believe that determining the clinical characteristics and markers of disease severity in MIS-C is an important step in pediatric emergency medicine.

MATERIALS and METHODS

Data Collection

In this study archival files of the patients diagnosed with MIS-C at the Pediatric Emergency Department of Ege University Faculty of Medicine between October 2020 and July 2022 were reviewed retrospectively. After approval obtained from the Ege University Medical Research Ethics Committee, patient data were accessed retrospectively (approval number: 22-8.1T73, dated: 25.08.2022).

Cases included in the study were selected according to the diagnostic criteria of MIS-C defined by The Centers for Disease Control and Prevention (CDC)[6]. Patients with immunodeficiency, those with a history of malignancy, and cases with other serious infectious diseases were excluded from the study. Besides, demographic characteristics, vital signs, clinical symptoms, laboratory values, echocardiography findings, treatment processes, and outcomes were retrieved from electronic patient files.

The study included patients who met the following CDC criteria:

1. Younger than 21 years old.

2. Presence of fever ≥38 °C, positive inflammatory laboratory markers, ≥2 organ system involvement, and symptoms of severe illness requiring hospitalization.

3. Evidence of recent SARS-CoV-2 infection or contact history.

4. No alternative diagnosis.

5. Presence of at least two of the following indications: cardiac, mucocutaneous, hematologic, or gastrointestinal involvement, and shock.

MIS-C cases were divided into two groups based on clinical severity of the disease as "Severe MIS-C" and "Mild MIS-C." The "Severe MIS-C" group consisted of

intensive care unit (ICU) patients, who required positive inotropic support, fluid replacement greater than 20 cc/kg or invasive mechanical ventilation[7]. The remaining cases were classified as "Mild MIS-C." Variables studied in both groups were comparatively evaluated.

Echocardiography

Echocardiography reports were reviewed retrospectively. Patients presenting to the Pediatric Emergency Department were evaluated by a pediatric cardiologist using a Vivid E9 ECHO device (General Electric Medical Systems Vivid, USA). Echocardiographic examinations were performed using S5 and S6 probes with a frequency range between 3-7 MHz. Echocardiographic reports included images obtained in subcostal, parasternal long-axis, short-axis, apical four-chamber, five-chamber, and suprasternal positions, incorporating M-mode, 2-dimensional, and Doppler examinations which assessed hemodynamic functions, valve functions, and proximal coronary artery measurements.

Statistical Analysis

Power analysis, conducted using G*Power v 3.1.9.7 software program indicated requirement of a minimum sample size of 50 patients to achieve 80% power at a significance level of α=0.05. Statistical analyses were performed using SPSS 21.0 software. The Kolmogorov-Smirnov test was used to assess the normality of data distribution. For comparisons involving more than two groups, one-way analysis of variance (ANOVA) was employed, provided that the data exhibited homogeneity of variance. In the comparison of two independent groups, Student's t-test was applied to normally distributed data, while the Mann-Whitney U test was used for data that did not meet the assumption of normality. The chi-square test was used to compare categorical variables, and ANOVA was used for comparisons involving two or more groups. The threshold for statistical significance was set at p<0.05. These methods were rigorously applied to ensure the reliability and validity of the findings.

RESULTS

A total of 52 patients were recruited into the study within a period of two years. The median age of the patients included in the study was 8 years (minimum: 2; maximum: 17), and 59% of them were male. The median age of severe, and mild MIS-C cases were 12 (minimum: 5; maximum: 17), and 4.5 (minimum: 2; maximum: 16) years respectively with a statistically significant difference between both groups (p<0.001). Mild clinical findings were more frequently observed in patients younger than six years, while severe cases were observed more often in patients over 12 years of age (p=0.001). Although comorbidities more frequently observed in cases with severe MIS-C, intergroup difference was not statistically significant (p=1) (Table 1).

Table 1. Demographic and clinical characteristics of MIS-C cases

		Mild MIS-C n=29	Severe MIS-C (a) n=23	p-value
Demographic data	**Age (years), median (minimum-maximum)**	4.5 (2-16)	12 (5-17)	<0.001
	Age groups (years) <6 6-12 >12	 16 8 5	 2 9 12	**0.001**
	Gender Male Female	 18 11	 13 10	0.779
	Presence of comorbidity (ies) (b) No Yes	 26 3	 20 3	1
Symptoms	**Duration of febrile episodes (days), mean ± SD**	4.07±2.13	5.78±1.80	**0.003**
	Sore throat No Yes	 25 4	 21 2	0.682
	Cough No Yes	 25 4	 23 0	0.120
	Dyspnea No Yes	 27 2	 21 2	1
	Abdominal pain No Yes	 22 7	 16 7	0.755
	Vomiting No Yes	 17 12	 13 10	1
	Diarrhea No Yes	 17 12	 14 9	1

Table 1. Continued

		Mild MIS-C n=29	Severe MIS-C (a) n=23	p-value
Symptoms	**Rash**			
	No	14	16	0.162
	Yes	15	7	
	Headache			
	No	26	21	1
	Yes	3	2	
	Loss of smell and taste			
	No	28	23	1
	Yes	1	0	
	Impaired consciousness			
	No	27	19	0.387
	Yes	2	4	
Findings	**Tachypnea**			
	No	28	19	0.157
	Yes	1	4	
	Tachycardia			
	No	27	6	**<0.001**
	Yes	2	17	
	Hypotension			
	No	29	4	**<0.001**
	Yes	0	19	
	Shock (c)			
	No	29	2	**<0.001**
	Yes	0	21	
	Lymphopathy			
	No	26	21	1
	Yes	3	2	
	Conjunctivitis			
	No	19	12	0.400
	Yes	10	11	
	Peelings of lips			
	No	29	21	0.191
	Yes	0	2	
	Strawberry tongue			
	No	29	22	0.442
	Yes	0	1	
	Eyelid edema			
	No	27	19	0.387
	Yes	2	4	
	Mucocutaneous lesions (d)			
	No	13	9	0.781
	Yes	16	14	

Table 1. Continued

		Mild MIS-C n=29	Severe MIS-C (a) n=23	p-value
Findings	**Neck stiffness**			
	No	28	21	0.577
	Yes	1	2	
	Seizures			
	No	28	23	1
	Yes	1	0	

(a): MIS-C cases admitted to the ICU or those requiring shock therapy with inotropic support (≥20 cc/kg) normal saline deficit or invasive mechanical ventilation support were grouped as "Severe MIS-C".

(b): Comorbidities included hydronephrosis, L-TGA, allergic asthma, UPD, IgA deficiency, and Type 2 DM.

(c): Cases with ≥2 clinical signs of shock (prolongation in capillary refilling time, pale-cold or mottled skin, weak peripheral pulses, altered consciousness) or cases given inotropic support/NS deficit were evaluated within the scope of shock.

(d): Mucocutaneous findings include presence of one of the following: rash, conjunctivitis, lip peeling/fissuring, strawberry tongue, eyelid edema.

MIS-C: Multisystem inflammatory Syndrome in Children, NT-proBNP: N-terminal pro-B-type natriuretic peptide, RCA Z score: Z score for the right coronary artery, LCA Z score: Z score for the left coronary artery, IVIG: Intravenous immunoglobulin, L-TGA:Levo-transposition of the great arteries UPD: Uniparental disomy, ICU: Intensive care unit, IgA: Immunoglobulin A, Type 2 DM: Type 2 diabetes mellitus

In the severe MIS-C group, the mean duration of fever was statistically significantly prolonged (5.78±1.80 days (p=0.003). Other clinical findings were observed with similar frequencies between the mild and severe MIS-C groups. However, clinical findings such as tachycardia, hypotension, and shock were significantly more frequent in severe MIS-C cases (p<0.001) (Table 1).

Any statistically significant differences were not observed between both groups in terms of hemoglobin levels (p=0.847), leukocyte (p=0.143), and platelet (p=0.105) counts. However, neutrophil (p=0.043) and lymphocyte (p=0.047) counts differed significantly between groups.

When examining inflammation markers, procalcitonin (p=0.694), C-reactive protein (CRP) (p=0.138), erythrocyte sedimentation rate (p=0.321), lactate dehydrogenase (p=0.883), ferritin (p=0.042), fibrinogen (p=0.098), and D-dimer (p=0.139) values were not found to be statistically significant. The average serum albumin value was significantly lower in the severe MIS-C group (3.17±0.56) compared to the mild MIS-C group (p=0.003). Urea and creatinine values were significantly higher in the severe MIS-C group (p=0.010; p=0.012). International normalized ratio and prothrombin time

values did not show a statistically significant difference between both groups. When cardiac markers were examined, significant differences in N-terminal pro-B-type natriuretic peptide (NT-proBNP) and troponin T levels were observed between severe and mild cases of MIS-C. (p≤0.05, p<0.011, Table 2)

Statistically significant cardiological findings were detected including increased troponin levels, echocardiographic evidence of valvular insufficiency, and a decrease in ejection fraction (EF) (p=0.011, p=0.013, p<0.001, Table 3). Myocarditis was observed in 25% of patients (13 cases) without any significant relevant difference between groups of cases with severe and mild MIS-C (p=0.54). Additionally, any significant intergroup difference was not found when when compared in terms of NT-proBNP elevation, presence of pericardial effusion, coronary involvement, and Z scores according to the location of coronary involvement (Table 3).

Table 2. Laboratory values in MIS-C cases

		Mild MIS-C median (min-max)	Severe MIS-C median (min-max)	p-value
Hemogram	Hemoglobin	11.1 (9-13.1)	10.8 (7.5-16.1)	0.847
	Leukocyte	10150 (2530-29000)	12150 (3870-39800)	0.143
	Neutrophil	6850 (1610-21490)	9940 (3090-30700)	**0.043**
	Lymphocyte	1340 (460-6380)	1020 (240-6600)	**0.047**
	Platelet	223000 (76000-691000)	164000 (43000-509000)	0.105
Inflammation markers	Procalcitonin	1.95 (0.21-60)	1 (0.12-27.8)	0.694
	CRP	158±75	187±84.6	0.138
	ESR	43.5 (9-114)	34 (8-126)	0.321
	Albumin	3.67±0.50	3.17±0.56	**0.003**
	LDH	271 (158-401)	276 (86-621)	0.883
	Ferritin	288 (29.8-996)	541 (34-1779)	**0.042**
	Fibrinogen	584 (270-880)	512 (191-1016)	0.098
Biochemistry	Glucose	105 (56-224)	108 (63-149)	0.852
	Urea	19 (10-32)	26 (13-188)	**0.010**
	Creatine	0.39 (0.2-0.9)	0.56 (0.31-4.49)	**0.012**
	Na	133±3.09	133±5.8	0.810
	AST	25 (11-74)	28 (10-98)	0.472
	ALT	19 (7-73)	29 (8-124)	0.253
	Triglyceride	183 (119-253)	225 (98-523)	0.423
Coagulation markers	INR	1.1 (0.9-1.58)	1.1 (0.8-11)	0.440
	PTZ	25.7±3.12	25.5±3.11	0.992
Cardiac markers	NT-proBNP	942 (50-17310)	3354 (113-33841)	**0.05**
	Troponin T, ng/L			**0.011**
	Low	22	9	
	High	7	14	
COVID	**COVID PCR**			0.330
	Negative	25	20	
	Positive	0	1	
	COVID serology			0.330
	Negative	1	3	
	Positive	25	20	

CRP: C-reactive protein, ESR: Erythrocyte sedimentation rate, LDH: Lactate dehydrogenase, AST: Aspartate amnotransferase, ALT: Alanne amptransferase, INR: International normalized ratio, PTZ: Partial thromboplastin time, PCR: Polymerase chain reaction, MIS-C: Multisystem inflammatory Syndrome in Children, Min-max: Minimum-maximum, Na: Carbon, NT-proBNP: N-terminal pro-B-type natriuretic peptide, COVID: Coronavirus disease

When comparing treatment methods, IV inotropes and steroids were significantly more frequenty used in severe cases of MIS-C (p<0.001; p=0.033). Administration frequency of intravenous immunoglobulin and antibiotics did not differ between both groups (Table 3).

All cases (n=52; 100%) admitted to the ICU were hospitalized for treatment either in the ICU (38.4%) or monitored in the general pediatric unit (61.6%). The severe MIS-C group was observed more frequently in the ICU (p<0.001). The median hospital stay was 10.5 days (minimum: 4; maximum: 27). Hospital stay of the severe MIS-C group that was admitted to the ICU was statistically significant longer than the group that was not (p<0.001; Table 3).

DISCUSSION

In clinical settings, MIS-C commonly presents with fever, myocarditis, and shock. Recent recommendations increasingly emphasize these clinical manifestations[8,9]. In our study, the severe MIS-C group exhibited longer duration of fever, along with the presence of shock, tachycardia, and hypotension. The prolonged febrile episodes suggest an extended inflammatory process, potentially contributing to the increased severity of the illness. In patients with severe MIS-C, protracted fever and shock may indicate a more severe disease course.

The literature indicates that lymphopenia, hypoalbuminemia, and elevated ferritin levels are significant diagnostic parameters of MIS-C as also emphasized in newly developed recommendations[6,8,10-13]. In our study, as inflammatory markers lymphopenia (1020 cells/μL), hypoalbuminemia (3.45±0.58 g/dL), and increased ferritin (541 μg/L) levels were significantly, and more frequently detected in the severe MIS-C group compared to the mild MIS-C group which suggests the importance of monitoring lymphopenia and albumin levels in tracking disease progression and determining prognosis. As expected, ferritin levels were higher in

Table 3. Cardiac investigations, treatment modalities and outcomes in MIS-C cases

		Patients, n	Mild MIS-C patients, n	Severe MIS-C patients, n	p-value
Cardiac markers and echocardiographic findings	Increased troponin levels, n (%)	21	7	14	**0.011**
	Increased NT-proBNP levels	49	28	21	1
	Myocardite	13	4	9	0.54
	Coronary involvement	6	2	4	0.387
	LCA Z scores Perivascular hyperechogenicity Dilatation only Small aneurysm	 2 1 2	 1 1 1	 1 0 1	0.840
	RCA Z scores Perivascular inflammation Hyperechogenicity Small aneurysm Medium-sized aneurysm	 2 1 1	 1 0 1	 1 1 0	0.548
	Pericardial effusion	11	6	5	1
	Valve insufficiency	15	4	11	**0.013**
	Decreased ejection fraction	23	4	19	**<0.001**
Medications used for treatment	Inotropes	15	0	15	**<0.001**
	IVIG	49	27	22	1
	Streoids	37	17	20	**0.033**
	Antibiotics	48	25	23	0.120
Outcome	**Hospitalization** In service In intensive care unit	 32 20	 29 0	 3 20	**<0.001**
	Hospitalization, days, median (min-max)	10.5 (4-27)	9 (4-15)	15 (9-27)	**<0.001**

LCA: Left coronary artery, RCA: Right coronary artery, IVIG: Intravenous Immunoglobulin

the severe MIS-C group than in the mild MIS-C group, serving as a significant indicator of disease severity. Elevated CRP has been emphasized as a significant diagnostic parameter of MIS-C[14]. However, in our study, while elevation of CRP was an important diagnostic parameter at the onset of the disease it was not useful for determining disease severity. Further research should be conducted to determine a cut-off value for differential diagnosis between severe and mild disease. Although neutrophil, creatinine, and urea are apparently clinically significant biomarkers in severe MIS-C, their values remained within the reference range, precluding their use in disease assessment.

In cases with MIS-C, the prognostic significance of cardiac markers has been substantially emphasized in the literature[10,15-19]. In the study by Bichali et al.[20], elevated NT-proBNP values demonstrated higher diagnostic specificity and sensitivity in identifying cardiogenic shock. Our study revealed significantly elevated NT-proBNP and troponin levels in severe cases with MIS-C. These cardiac enzymes are significant prognostic markers in cases with MIS-C, and the presence of serious myocarditis in cases with severe MIS-C is a crucial finding, highlighting the need for clinicians to exercise greater vigilance in practice.

Any statistically significant difference was not observed between both groups in terms of COVID-PCR and serological test results. Our study, expectedly indicates that most cases had a prior COVID-19 infection 4-6 weeks before their presentation[21]. Although serology tests performed 4-6 weeks after recovery from COVID-19 infection revealed the presence of MIS-C in most patients, this finding was not sufficient to differentiate between severe and mild disease presentations. The underlying mechanism linking MIS-C with a COVID-19 infection suffered 4-6 weeks priorly is complex and not fully understood. Further observation and research are warranted to elucidate this relationship.

In MIS-C, cardiac involvement and echocardiographic findings include reduced ventricular EF, mitral regurgitation, pericardial effusion, and coronary artery involvement[22-26]. Echocardiographic findings are highly significant prognostic markers. Our study found that reduced EF and valve insufficiency were significant indicators in patients with clinically worsening conditions, differentiating between mild and severe MIS-C. A key finding of our study is the concordance of these echocardiographic findings with elevated troponin levels (Figure 1). Although coronary involvement may affect long-term prognosis, it isn't significant in determining disease severity at initial presentation. Pericardial effusion has been observed with similar frequency in both mild and severe cases, which is frequently encountered in mild cases of viral infections.

Treatment approaches for patients diagnosed with MIS-C vary based on the clinical severity of the disease. Herber et al.[27] demonstrated that patients with elevated NT-proBNP and troponin levels often require intensive care. In the literature, myocardial dysfunction has been associated with shock in these patients[26]. Our data corroborate these findings, indicating that patients with elevated NT-proBNP and troponin levels exhibit

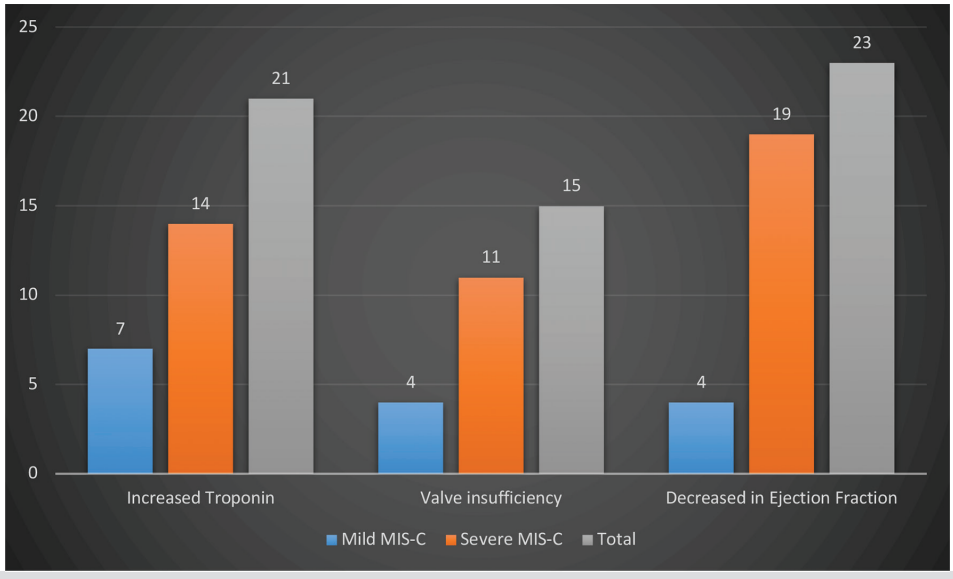

Figure 1. Significant cardiac markers and echocardiographic findings

shock and clinical manifestations of severe MIS-C. Compared to mild MIS-C cases, severe MIS-C cases are characterized by a significant need for inotropic support and prolonged ICU stay. All patients who received initial treatment with inotropic medications required ICU admission. The duration of stay in the ICU was prolonged in the severe MIS-C group (median 15 days). Patients were discharged from the ICU after inotropic medications were discontinued and hypotension and hemodynamic parameters improved. In our clinic, the prominent use of steroids in severe MIS-C cases was a notable finding. Intravenous pulse steroids were administered to severe MIS-C patients in shock during their ICU stay.

Study Limitations

Certain limitations were inherent in our study. The single-center study design, coupled with the relative rarity of cases with MIS-C, constrained the sample size, thereby potentially affecting the generalizability of the findings. The need for intensive care follow-up was determined based on echocardiography findings, which is quikly performed and inexpensive coronary imaging. Future research may include more detailed examinations of the coronary arteries using advanced imaging techniques such as computed tomography angiography and magnetic resonance imaging.

CONCLUSIONS

The clinical recognition of MIS-C, a novel illness emerging after the COVID-19 pandemic, is increasingly important. Even though we may encounter it less frequently, MIS-C remains a condition that requires recognition due to its potential for mortality and long-term sequelae. Classifying MIS-C as either severe or mild can aid clinicians in diagnosis and modify treatment strategies. This classification allows for the prioritization of rapid intervention for patients with severe MIS-C. When evaluating MIS-C, the following findings should raise suspicion for severe disease: fever lasting longer than 5 days, signs of hypotension, tachycardia, and shock; detection of inflammatory markers such as lymphopenia, unexpectedly lower serum albumin levels, increased levels of ferritin and cardiac markers like troponin and NT-proBNP; and echocardiographic findings of reduced EF and valve insufficiency.

Ethics

Ethics Committee Approval: After approval obtained from the Ege University Medical Research Ethics Committee, patient data were accessed retrospectively (approval number: 22-8.1T73, dated: 25.08.2022).

Informed Consent: Retrospective study.

Footnotes

Author Contributions

Surgical and Medical Practices: O.A., E.U.S., Concept: Z.Ş.B., Design: T.K.G., G.A., R.E.L., Data Collection or Processing: O.A., T.K.G., Analysis or Interpretation: C.T., A.Y., G.A., E.U.S., Literature Search: O.A., E.U.S., Writing: O.A.

Conflict of Interest: The authors have no conflict of interest to declare.

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