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A cross sectional study to evaluate the clinical presentation in multisystem inflammatory syndrome in children

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ABSTRACT

Background: MIS-C as a disease has varied symptoms and signs that affect multiple organs and systems in the body. The present study aimed to describe the clinical presentation among children admitted as a case of multisystem inflammatory syndrome in children in Indira Gandhi Medical College, Shimla.

Methods: We conducted a cross sectional study of children with MIS-C from January to July 2021, in the pediatric ward of Indira Gandhi Medical College Shimla in Himachal Pradesh. All children admitted with a diagnosis of MISC were included in the study. Data regarding clinical presentation was extracted and analyzed using Epi Info V7 software.

Results: In the present study, a total of 31 children diagnosed and admitted as a case of multisystem inflammatory syndrome in children (MIS-C) were included. Mean age of these children was 7.12 ± 4.78 years. Among the total 16 (51.6%) were males while 15 (48.4%) were females. All 31 patients had presented with fever and 13 (41.9%) patients had fever with rash. 5 (16.1%) had cough, 1 (3.2%) child presented with hematemesis, 18 (58.1%) had tachypnea at presentation and 15 (48.4%) patients had respiratory distress. 16 (51.6%) children had complaints of vomiting, 1 (3.2%) presented with bleeding diathesis and 12 (38.7%) had hematuria, 5 (16.1%) had seizures and 8 (25.8%) presented with encephalopathy. 19 (61.3%) children had hypotension, 15 (48.4%) had hepatomegaly and 15 (48.4%) had splenomegaly.

Conclusions: It is very essential to characterize this syndrome to fully understand its spectrum, therefore we need to be continuously watchful for its varied clinical presentations, both for ensuring an early diagnosis and treatment of patients suffering from MIS-C.

Keywords: Clinical presentation, Multisystem inflammatory syndrome in children, fever, COVID-19

INTRODUCTION

Multisystem inflammatory syndrome in children (MIS-C), is a potentially serious and life threatening disease in children and appears to be a delayed & post-infectious complication of SARS-CoV-2 or COVID-19 infection.^{1,2} Clinical presentation of this disease is highly variable as symptoms of MIS-C may vary from case to case, also it can present with any organ system involvement. Most children present with only a mild illness but in children

who go on to develop moderate to severe MIS-C, multiple organ systems such as the vascular, renal, cardiovascular, respiratory system, gastrointestinal tract, central nervous system or skin maybe involved. Signs and symptoms of MIS-C depend on which organ system is predominantly involved.^{3,4}

The main symptoms of MIS-C are persistent fever, lasting for more than 24 hours and maybe pre-existing for several days prior to seeking medical aid, fatigue/

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malaise, rash, conjunctival congestion/injection, cough, difficulty and shortness of breath with exertion or rest, abdominal pain, vomiting, diarrhea, loss of appetite, dehydration, cold and clammy skin, very low blood pressure, dizziness, confusion, light headedness, tachycardia or irregular rhythms, headache, neck pain, numbness/tingling in the hands and feet, seizures etc.²

MIS-C mostly affects school-age children, between five-to fifteen-year-olds, but this syndrome is being increasingly recognised in infants as well as in young adults. MIS-C symptoms usually appears between 2 to 6 weeks (4 weeks on average) after COVID-19 infection, although this is still under evaluation. Symptoms of MIS-C can worsen quickly, so seeking timely and proper medical attention is very important to reduce the morbidity and mortality. ^{5,6}

MIS-C is considered a syndrome i.e a group of signs and symptoms, not a disease, because still much is unknown about this syndrome, including its causes and risk factors. Identifying and studying more children who suffered from MIS-C can help to eventually shed light on this syndrome.^{3,6}

There is a paucity of data regarding the signs and symptoms of MIS-C in this hilly region of the Western Himalayas. Against this backdrop, the study was conducted to describe clinical presentation among children admitted as a case multisystem inflammatory syndrome in children (MIS-C) in Indira Gandhi medical college, Shimla.

Aims and objectives

Aim and objective of current investigation was to evaluate the clinical presentation associated with multisystem inflammatory syndrome in children.

METHODS

This cross sectional institutional based descriptive study was conducted in the Department of Pediatrics, Indira Gandhi Medical College, Shimla, Himachal Pradesh, between January 2021 to July 2021. All children, irrespective of age group or gender who were admitted with a diagnosis of MIS-C in the pediatric department were included.

Operational definition for a case of MIS-C

Children and adolescents 0–19 years of age with fever > 3 days and two of the following: rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammation signs (oral, hands or feet); hypotension or shock; features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated troponin/NT-proBNP); evidence of coagulopathy (by PT, PTT, elevated d-dimers); acute gastrointestinal problems (diarrhoea, vomiting, or

abdominal pain) and elevated markers of inflammation such as ESR, C-reactive protein, or procalcitonin and no other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes and evidence of COVID-19 (RT-PCR, antigen test or serology positive), or likely contact with patient with COVID-19. Permission was obtained from the concerned authorities of Indira Gandhi Medical College Shimla in Himachal Pradesh

Data analysis

The data was collected from the record files of admitted children, compiled and entered in MS Excel, and analyzed using appropriate statistical tools in software Epi info V7 by applying appropriate statistical test in terms of frequencies and percentage.

RESULTS

In the present study a total of 31 children were diagnosed and admitted as a case of MIS-C, according to the WHO case definition, in the pediatric ward of Indira Gandhi Medical College Shimla in Himachal Pradesh between January 2021 to July 2021. In the present study, mean age of the children diagnosed as multisystem inflammatory syndrome in children was 7.12±4.78 years. Maximum 12 (38.7%) children were of the age group 5-10 years followed by 10 (32.3%) children of age group 6-10 years, 8 (25.8%) children of 11-15 years and 1 (3.2%) of 15-19 years age group. Among the total children 16 (51.6%) were males while 15 (48.4%) were females. 29 (93.5%) children belonged to rural area while 2 (6.5%) to Urban area. (Table 1) (Figure 1).

Table 1: Socio-demographic variables of MISC-C patients.

Parameters		N	%
Age group (years)	0-5	12	38.7
	6-10	10	32.3
	11-15	8	25.8
	15-19	1	3.2
Mean age (years)	7.12±4.78		
Gender	Male	16	51.6
	Female	15	48.4
Rural/urban	Rural	29	93.5
	Urban	2	6.5
Total		31	100.0

In the present study, all the 31 children had fever as the presenting complaint. Among them, variation based on the degree of fever was: 3 (9.7%) had temperature in the range of 98.4-100°F, 12 (38.7%) had 100-102°F, 12 (38.7%) had 102-104°F and 4 (12.9%) children had more than 104°F temperature rise. Among the total, 1 (3.2%) child had fever for a duration of 2 days, 6 (19.4%) children for 3 days, 12 (38.7%) for 4 days, 5 children for

5 days, 3 (9.7%) children for 6 days, 3 (9.7%) for a duration of 7 days and 1 (3.2%) for 8 days. In the present study, 13 (41.9%) children presented with rash along with fever (Table 2).

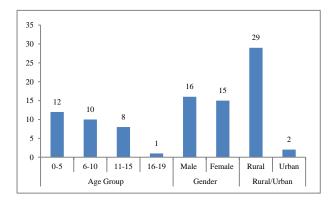


Figure 1: Socio-demographic variables of MISC-C patients.

Table 2: Characteristics of fever among MISC-C patients.

Variables		N	%
Fever	Yes	31	100.0
	No	0	0.0
	No fever	0	0.0
	98.4 - 100	3	9.7
Temperature (°F)	100 - 102	12	38.7
	102-104	12	38.7
	>104	4	12.9
	2	1	3.2
	3	6	19.4
Dunction of forces	4	12	38.7
Duration of fever (days)	5	5	16.1
	6	3	9.7
	7	3	9.7
	8	1	3.2
Rash	Yes	13	41.9
Nasii	No	18	58.1

In the present study, out of the total of 31 children, 5(16.1%) had cough. Among them, 1 (3.2%) had cough duration of 1 day, 2 (6.5%) children for 2 days, 1 (3.2%) child for 3 days and 1 (3.2%) for 4 days. Among the total 3 (9.6%) patient had productive cough while 2 (6.5%) patients had non-productive cough. In the present study, only 1 (3.2%) child had hematemesis, 18 (58.1%) children had tachypnea and 15 (48.4%) had respiratory distress (Table 3). In this study, 16 (51.6%) children had vomiting at presentation. Among them 4 (12.9%) children had 2 episodes/day, 2 (6.5%) had 3 episodes/day, 8 (25.8%) children had 4 episodes/day, 1 (3.2%) child had 6 episodes/day and 1 (3.2%) had more than 8 episodes/day. In this study, 1 (3.2%) child had complaint of vomiting lasting for 1 day, 6 (19.4%) children for 2 days, 1 (3.2%) child for 3 days, 6 (19.4%)

children for 4 days, 1 (3.2%) children for 5 days and 1 (3.2%) for 10 days or more.

Table 3: Respiratory and cardiac sign & symptoms among MISC-C patients.

Variables		N	%
Cough	Yes	5	16.1
	No	26	83.9
Duration of cough in	1	1	3.2
	2	2	6.5
	3	1	3.2
days	4	1	3.2
	No cough	26	83.9
	No cough	26	83.9
Productive/non- productive	Productive	3	9.6
	Non- productive	2	6.5
Hematemesis	Yes	1	3.2
	No	30	96.8
Tachypnea	Yes	18	58.1
	No	13	41.9
Respiratory distress	Yes	15	48.4
	No	16	51.6

In our study, only 1 (3.2%) child had bleeding diathesis and 12 (38.7%) patients had hematuria (Table 4). In our study, 5 (16.1%) children had seizures and all these 5 (16.1%) had generalized tonic clonic type of seizures. We also studied the frequency of seizures, 3 (9.7%) had 1 episode, 1 (3.2%) had 2 episodes and 1 (3.2%) had 8 or more episodes of seizures. In this study, 8 (25.8%) children presented in encephalopathy. Among them 5 (16.1%) had GCS ranging between 12-15 and 3 (9.7%) had GCS between 9-12 (Table 5). In this study, 19(61.3%) hypotension at presentation, 3 (9.7%) had normal heart rate and 5 (16.1%) had bradycardia and 23 (74.2%) had tachycardia. Out of the 31 total children, 8 (25.8%) had single group lymphadenopathy, 1 (3.2%) had two contiguous groups of enlarged LAP and 1 (3.2%) child had generalized LAP. 15 (48.4%) children had hepatomegaly and 15 (48.4%) children had splenomegaly at presentation (Table 6).

DISCUSSION

Children presenting with MIS-C had varied symptoms and signs, depending on the affected organs systems. Most patients reported significant gastrointestinal symptoms, cardiac disease, mild to severe respiratory distress, rash, conjunctival injection, and oral mucous membrane changes. Many children of MIS-C have symptoms resembling Kawasaki disease or toxic shock syndrome, with coronary arteries dilatation or aneurysm. Also common are heart inflammation resulting in impaired heart function, conduction abnormalities & hypotension and shock.

Table 4: Gastrointestinal and hematological sign& symptoms among MISC-C patients.

Variables		N	%
Vomiting	Yes	16	51.6
	No	15	48.4
	None	15	48.4
	2	4	12.9
3.6 /3	3	2	6.5
Max no /day	4	8	25.8
	6	1	3.2
	8	1	3.2
Duration (days)	None	15	51.6
	1	1	3.2
	2	6	19.4
	3	1	3.2
	4	6	19.4
	5	1	3.2
	10	1	3.2
Planding diathoric	Yes	1	3.2
Bleeding diathesis	No	30	96.8
Hematuria	Yes	12	38.7
	No	19	61.3

Table 5: Neurological sign and symptoms among MISC-C patients.

Variables		N	%
Seizure	Yes	5	16.1
	No	26	83.9
Туре	None	26	83.9
	GTC	5	16.1
	None	26	83.9
No. of seizures till	1	3	9.7
Admission	2	1	3.2
	8	1	3.2
Encephalopathy	Yes	8	25.8
	No	23	74.2
	15	23	74.2
GCS	12-15	5	16.1
	9-12	3	9.7

All these symptoms can occur in several varied combinations in a patient with MIS-C.^{6,7} In the present study, mean age of the children diagnosed as multisystem inflammatory syndrome in children (MIS-C) was 7.12±4.78 years. Maximum 12 (38.7%) were of age group 5-10 years followed by 10 (32.3%) of age group 6-10 years, 8 (25.8%) of 11-15 years and 1 (3.2%) of 15-19 years age group. Of the total 31 children, 16 (51.6%) were males while 15 (48.4%) were females. 29 (93.5%) belonged to rural area while 2 (6.5%) were from urban area. Mean weight of the participants were 20.11±11.60 kg. All 31 patients had presented with fever and 13 (41.9%) children had rashes along with fever. 5 (16.1%) had cough, 1 (3.2%) children had hematemesis, 18 (58.1%) children had tachypnea and 15 (48.4%) had

respiratory distress. 16 (51.6%) children had complaints of vomiting, 1 (3.2%) child had bleeding diathesis and 12 (38.7%) had hematuria. 5 (16.1%) children had seizures and 8 (25.8%) presented with encephalopathy. 19 (61.3%) children presented with hypotension, 15 (48.4%) had hepatomegaly and 15 (48.4%) children had splenomegaly. Similar types of results were observed in the studies done by Hoste et al, Fouriki et al, Leora et al and Ahmed et al.⁸⁻¹¹

Table 6: Systemic signs and symptoms among MISC-C patients.

Variables		N	%
Hypotension	Yes	19	61.3
	No	12	38.7
	Normal HR	3	9.7
Heart rate	Bradycardia	5	16.1
· ·	Tachycardia	23	74.2
Lymphadenopathy	No LAP	21	67.7
	Single group	8	25.8
	Two group	1	3.2
	Generalized LAP	1	3.2
Hepatomegaly	Yes	15	48.4
	No	16	51.6
Splenomegaly	Yes	15	48.4
	No	16	51.6

So, if any child experiences persistent fever of 100.4 deg or more lasting for more than 3 to 4 days along with rashes, cough, hematemesis, tachypnea, respiratory distress, vomiting, bleeding diathesis, hematuria, seizures, feeling unusually weak or unusually sleepy or confused, consultation with a pediatrician necessary.^{2,4,12} MIS-C is a treatable illness and most children recover fully from this with judicious medical care. Timely treatment can control the inflammation and help avoid organ damage, especially cardiovascular involvement. With prompt recognition and medical attention, most children survive but the long-term outcomes from this condition are still unknown. Some children rapidly detoriate, to critical state. Much remains to be learned about this emerging inflammatory syndrome.^{2,4,12} Despite increasing experience, we may encounter a new finding every day in MIS-C patients. Therefore, everyone should contribute to medical literature by presenting the clinical sign and symptoms of MIS-C cases.

CONCLUSION

As it seems that COVID-19 pandemic might persist for a long time, we will be likely to see more and more MIS-C patients. In the present study most of the children experienced persistent fever of 100.4 deg or more which last for more than 3-4 days along with rashes, cough, hematemesis, tachypnea, respiratory distress, vomiting, bleeding diathesis, hematuria, seizures, feeling unusually

weak, with encephalopathy. It is essential to characterize this syndrome to have standardized data describing clinical presentations to understand the full spectrum of disease. Also, we need to be continuously vigilant about its clinical presentations for ensuring the early diagnosis and treatment of patients with MIS-C.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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