Bangladesh J Med Microbiol 2020; 14 (1): 22-24
Bangladesh Society of Medical Microbiologists

Review Article

Multisystem inflammatory syndrome (MIS-C) in children with COVID-19

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Introduction

Multisystem inflammatory syndrome in children (MIS-C), is identified in recent times as a serious illness in children. It is also known as pediatric multi-system inflammatory syndrome (PMIS or PIMS). It may or may not be related with COVID-19[1].

COVID-19 mortality is highest in comorbid patients, like cardiovascular disease, diabetes mellitus, lung disease and immune suppressed patients. COVID-19 was generally described as asymptomatic or with mild symptoms in children, and very few pediatric hospitalization and minimal mortality has been reported. At April 2020, few cases of severe multisystem inflammatory syndrome associated with SARS-CoV-2 was reported by some countries from Europe and North America; but symptoms were overlapped with Kawasaki disease (KD) or toxic shock syndrome (TSS). Some proportion of children were reported with severe or fatal COVID-19 syndrome[2]. The Centers for Disease Control and Prevention (CDC) published a case definition for multisystem inflammatory syndrome in children (MIS-C) for disease surveillance in May 2020[3].

Actually MIS-C is a syndrome-a group of signs and symptoms, not a disease. Children presented with excessive blood clotting, gastrointestinal symptoms, renal symptoms, nervous system symptoms, or impaired heart function, which may also occur in different disease conditions[4].

It is hypothesized that MIS-C is mostly post infectious and distinct from COVID-19 because some patients were SARS-CoV-2 negative and MIS-C peaked after COVID-19 was reported[3].

Presentation of SARS-CoV-2 infection in children

At first Children presented with fever, rash, conjunctivitis, peripheral edema, gastrointestinal symptoms, shock, and elevated markers of inflammation and cardiac damage, out of a total 570 U.S. MIS-C patients that had been reported to CDC up to July 29, 35.6% of the patients had similar clinical course with previously published MIS-C reports, characterized predominantly by shock, cardiac dysfunction, abdominal pain, and markedly elevated inflammatory markers. Almost all had positive SARS-CoV-2 test results. The remaining 367 (64.4%) MIS-C patients had manifestations that appears to overlap with acute COVID-19 (2-4), had a less severe clinical course, or had features of Kawasaki disease. Average duration of hospitalization was 6 days; 364 patients (63.9%) required care in an intensive care unit (ICU), and 10 patients (1.8%) died. COVID-19 pandemic is still ongoing with varieties of symptoms, so clinicians should be alert concurring the signs and symptoms of MIS-C. They should report suspected cases to their central level; because analysis of reported cases can enhance understanding of MIS-C and improve characterization of the illness for early detection and treatment[5].

Some children presents with rash, red eyes, swollen hands and feet, cracked lips, strawberry tongue and an enlarged lymph node in the neck. Some presents with flu-like symptoms like high fever, with rash, low blood pressure, and a very high heart rate. Some children presents with diarrhea, vomiting, abdominal pain, or a swollen abdomen. Other presentation reported with COVID-19, such as persistent cough and shortness of breath, may or may not be present[6].

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Many reports have described high rates of asymptomatic infection in children with acute Covid-19. However, 16% and 19% of pediatric asymptomatic cases are found in some meta-analyses. A recent study of four French hospitals screened all admitted patients for SARS-CoV-2 infection by PCR and found 45% of the 438 positive pediatric cases hospitalized were asymptomatic[7].

What causes multi-system inflammatory syndrome in children?

The cause of MIS-C is still unknown. Some researchers suspect that MIS-C is caused by a delayed or excessive immune response to the coronavirus, causing inflammation that damages organs. As very few children develop MIS-C, genetic factors may be possible cause for some children being susceptible.

Children has suffered less in COVID-19 comparing to adults. Very few children develop signs and symptoms of MIS-C, and most have recovered quickly[6].

Some children with MIS-C tested for SARS CoV-2 antibody and got positive result which indicates that they've had a recent or previous infection with the COVID-19 virus. In the U.S., it is observed that Black and Latino children have been diagnosed with MIS-C compared with other races and groups. Obviously further studies are needed to determine other factors.

The affected age group of children with MIS-C are between 3 to 12 years old (average 8 years). Older children and babies with MIS-C are also reported[4].

Complications

Many clinicians consider MIS-C as a complication of COVID-19. MIS-C can lead to severe problems with vital organs, such as the heart, lungs or kidneys if early diagnosis and proper management fails. MIS-C could result in permanent damage or even death rarely.

Prevention

In the U.S., the Pfizer-BioNTech COVID-19 vaccine is now available to people aged 12 and older. A vaccine can prevent children from getting the COVID-19 virus and also from becoming very ill[4].

CDC recommends following precautions for avoiding exposure to the virus that causes COVID-19: to keep hands clean with soap or 60% alcohol, to avoid people who are sick and contagious, to practice social distancing at least 6 feet from other people, to wear cloth face masks in public settings, to avoid touching your nose, eyes and mouth, to cover your mouth with a tissue or your elbow when you sneeze or cough, to clean and disinfect high-touch surfaces every day and to wash clothing and other items as needed.

Conclusion

COVID-19 pandemic is going on with increasing number of cases; health care providers should continue to screen patients to identify children with MIS-C. Suspected MIS-C patients should be reported. Distinguishing patients with MIS-C from those with acute COVID-19 and other hyper inflammatory conditions is critical for early diagnosis and appropriate management. Studies to define the clinical and laboratory characteristics of MIS-C should continue which includes identification of parameters, because it will help distinguish the illness from other similar conditions[5].

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