

# Sepsis with *Staphylococcus aureus* in child with selective IgA deficiency and SARS-CoV-2 infection - case presentation

Gheorghita Jugulete<sup>1,2</sup>, Mihaela Safta<sup>2</sup>, Elena Gheorghe<sup>2</sup>, Bianca Borcos<sup>2</sup>,  
Monica Luminos<sup>1,2</sup>, Madalina Merisescu<sup>1,2</sup>

<sup>1</sup>“Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

<sup>2</sup>“Prof. Dr. Matei Bals” National Institute for Infectious Diseases, Bucharest, Romania

## ABSTRACT

Sepsis is one of the most severe pediatric infectious diseases that can progress to serious complications or even death without specialized treatment. It often evolves as a complication of a viral illness or against the background of a depressed host immune terrain.

SARS-CoV-2 infection is a self-limiting viral infection in children, which is rarely complicated, especially in immunocompromised or co-morbid individuals.

In this paper we present a clinical case of a 1-year and 2 months old child admitted to the Pediatric Infectious Diseases Clinical Department IX of the National Institute of Infectious Diseases “Prof. Dr. Matei Bals” with the diagnosis of SARS-CoV-2 infection. The positive diagnosis was established on epidemiological data (parents with SARS-CoV-2 infection), suggestive clinical picture (fever, inappetence, vomiting) and confirmed by RT-PCR. 72 hours after admission, with favorable clinical evolution, the child presented again fever and chills. Laboratory investigations show leukocytosis with neutrophilia, inflammatory syndrome present and, in nasal exudate and blood culture, staphylococcus aureus MSSA is isolated. Also, immunogram shows low IgA level, the rest of the laboratory tests are within normal limits. Antibiotic treatment was instituted, symptomatic hydroelectrolytic and acid-base rebalancing infusions with favourable evolution.

The case presented shows that although SARS-CoV-2 infection is often a mild condition in children, it can evolve severely, especially in immunosuppressed individuals with comorbidities. The presented child was not known to have selective IgA immunodeficiency, which probably in combination with COVID-19 induced immunosuppression, favored the development of sepsis.

**Keywords:** sepsis, *Staphylococcus aureus*, child, SARS-CoV-2, IgA deficiency

## INTRODUCTION

SARS-CoV-2 infection in children is a condition that takes mild clinical forms, especially in children or young people without comorbidities. However, in certain populations it can evolve severely with serious life-threatening complications. Sepsis is one of the most severe complications that usually occurs on a host's tarry ground. Congenital or acquired im-

munodeficiency (viral infections - measles, diabetes mellitus, autoimmune diseases, malignancies, atopic terrain and allergies, etc.) is one of the most common causes of sepsis complications [3,6,7]. In the absence of a rapid and correct diagnosis the evolution of sepsis is severe with the occurrence of multiple organ failure (MSOF) and even death in the absence of appropriate treatment. Sometimes even when correctly diagnosed and treated sepsis can

evolve severely due to the immunosuppressed terrain of the host [9,10].

## MATERIAL AND METHOD

In this article we present a pediatric case of COVID-19 complicated by sepsis with staphylococcus aureus, in a child with selective IgA deficiency, admitted to the Clinical Department IX of Infectious Diseases-Pediatrics of the National Institute of Infectious Diseases “Prof. Dr. Matei Bals” Bucharest.

Ten-month-old infant without significant PPA, presented with fever, chills, vomiting, inappetence, semi-tied stools, oligo-anuria. Onset of the condition was 72 hours prior to presentation with fever and chills, for which he received symptomatic treatment with unfavorable evolution. In development she associated inappetence, vomiting, diarrheal stools and oligo-anuria.

Among the personal medical pathological antecedents, we note an episode of IACRS at the age of 4 months and one of acute diarrhoeal disease at 7 months, conditions treated by the family doctor, without hospitalization. Hereditary history: parents without chronic diseases, currently both with symptoms of respiratory virology.

## RESULTS

On presentation to our clinic, emergency room, the infant was in poor general condition, febrile (38.5°C), pale, circling, without eruptive elements, cardio-respiratory balanced, lung without rales, thin abdomen, skin fold with a tendency to persist, thin abdomen, semilunar stools, oligo-anuric. Rapid SARS-CoV-2 antigen test performed urgently in the emergency room is positive, for which he is admitted.

Laboratory investigations performed in the emergency room show:

- Leukocyte count (NL=9800/mmc) and leukocyte formula within normal limits.
- Hypochromic anemia, intrainfectious microcytic but also deficiency Hb=10.2g/dl, Ht=31.5 %)
- Normal platelet count
- Inflammatory tests (VSH, fibrinemia, proinflammatory C-reactive) - negative
- Coagulogram normal
- Biochemistry samples: Urea=68 mg/dl, TGO=2N, LDH=406u/L, rest within normal limits
- Co-cultures (*Shigella spp.*, *Salmonella spp.*, *E. Coli spp.*, *Campylobacter spp.*, *Yersinia spp.*) - negative
- Faeces - rapid tests (*Rotavirus*, *Adenovirus*, *Norovirus*, *Enterovirus*) - negative

- Urinalysis - ketone bodies present, urine culture - negative
- Cardiopulmonary chest x-ray - bilateral sharp hilum, bilateral peribronchovascular infiltration, slightly enlarged heart, moderately enlarged mediastinum, narrowed vascular pedicle

Treatment is instituted:

- Symptomatic: antithermics, antivomomomics, antidiarrheals
- Hydro-electrolyte and acid-base rebalancing (glucose, saline)
- Antiviral: remdesivir, dose 5 mg/kgc on first day, then 2.5 mg/kgc/day for 4 more days

Evolution under treatment was favorable with disappearance of fever, normalization of stools, resumption of diuresis, appetite present. At 72 h after admission, she presented fever and chills, for which a complete clinical and biological evaluation was performed. Clinically, the child was in poor general condition, conscious, pale, without rash, febrile with cold extremities, tachycardic (AV=120/min, regular), polypneic (FR=40/min), abdomen supple, liver and spleen at the costal margin, no signs of meningeal irritation, diuresis present, stool normal.

Laboratory tests are collected: CBC, inflammatory samples, PCT-Q, immunogram, blood cultures, uroculture, stool cultures, pharyngeal and nasal exudate.

The results of laboratory investigations show:

- **leukocytosis with neurophilia** (NL=18,600/mmc, NS=92%)
- **anemia** (Hb=9.8 g/dl)
- platelet counts within normal limits
- **positive inflammatory samples** (C-reactive protein=125mg/dl, Fibrinemia=584 mg/dl, PCT-Q = 25 ng/dl)
- EAB - within normal limits
- Immunogram shows decreased serum Ig A levels - **selective IgA deficiency**
- Nasal exudate - **staphylococcus aureus MSSA** present (portal)
- Coprocult, urocult - negative
- **Blood culture - positive (24h) - Staphylococcus aureus (MSSA)**

Paraclinical:

- Cardiopulmonary X-ray - same appearance as 72 h ago.
- Cardiac echo - within normal limits
- Abdominal echo - discrete mesenteric adenopathy, kidney, liver and spleen within normal limits

Antibiotic treatment (Ceftriaxone + linezolid) is instituted, antiviral treatment is continued, symptomatic (antithermics), hydroelectrolytic rebalancing infusions and intranasal solution with ciprofloxacin.

cin. The evolution under the instituted treatment was favorable with disappearance of fever at 48 hours, clinical parameters within normal limits, appetite present.

Thus, based on epidemiological, clinical, laboratory and paraclinical data, the diagnosis was established:

- Severe SARS-CoV-2 infection complicated by:
  - Sepsis with *Staphylococcus aureus* MSSA
  - Hypochromic, deficiency and intrainfectious anemia
  - Acute renal failure of pre-renal cause (dehydration)
  - Acute non-isolated germ enterocolitis
  - Acute dehydration syndrome 8-10%

Discharged with good general condition, afebrile, cardiorespiratory and digestive balanced, no complaints, clinical examination within normal limits, appetite present, diuresis present normal stool. Laboratory investigations at discharge were within normal limits, except for an Hb = 10.2 g/dl (hypochromic, microcytic anemia, probably deficiency), without other complications or sequelae.

Thirty days after discharge she presented for follow-up:

- Normal clinical examination, no complaints, ascending weight curve.
- Biological - anaemia in remission (Hb = 11.3 g/dl), other investigations performed were within normal limits.

Remains however on discharge and follow-up 3 months after discharge. Also received recommendation for further immunological investigations in a specialist clinic to establish and frame the etiology of possible immune deficiency.

## DISCUSSIONS

The clinical and biological data observed in the presented clinical case are in agreement with the results reported by other authors in similar clinical studies, COVID-19 through induced immunosuppression created the prerequisites for sepsis in an immunocompetent pediatric patient [4,5,8]. The presence of *staphylococcus aureus* nasal carriage in a child with selective IgA deficiency (mucosal defense deficiency) was a factor favoring *staphylococcus aureus* bacteremia [4]. The positive diagnosis established rapidly by recognition of the specific clinical picture and confirmation by modern laboratory diagnostic methods allowed rapid and correct treatment [5,6,8,10,11]. Biological changes specific

to staphylococcal sepsis are similar to those reported by other authors in non-COVID clinical studies but also in patients with SARS-CoV-2 infection [5,9]. Some authors also found that there is a need for new measures and procedures in the management of staphylococcal sepsis following the impact of COVID-19 [2].

Deficient vaccination is one of the main causes of the presence of severe complications in both children and adults, sepsis being one of the most common and staphylococcal etiology is very high, these being responsible for an increased mortality rate [1].

## CONCLUSIONS

The clinical case presented demonstrates that although SARS-CoV-2 infection in children usually evolves mildly, it can sometimes be complicated in the presence of some favoring factors (congenital immunosuppression associated with that induced by the viral disease) against the background of nasal staphylococcal carrier status. Thus, it was possible to trigger an infectious process with severe evolution in a child in apparently good health with no significant personal pathological history.

We emphasize once again the importance of complete and urgent clinical evaluation with correct and rapid establishment of the diagnosis, and institution of timely and correct specialist treatment. Healing in the present case occurred completely and without sequelae, but the child requires long-term follow-up (possible distant sequelae) and not least far immunological investigations.

COVID-19-associated infections are a pediatric peculiarity, they are caused by pathogens specific to this age group (viruses) but also with microorganisms that can cause complications and severe forms of disease (bacteria or fungi). COVID-19 co-infections in children are possible because of the temporary immunosuppression created by SARS-CoV-2 and the fact that children at this age are not immunized.

It has been scientifically proven that vaccination of adults reduces the number of SARS-CoV-2 infections in the population but also of severe clinical forms of the disease and thus protects age groups that cannot be vaccinated (infants in our case). Clinical forms of the disease are more severe in children with COVID-19 associated infections, with a longer hospitalization period, additional costs and discomfort.

*Conflict of interest:* none declared

*Financial support:* none declared

## REFERENCES

1. Chivu CD, Craciun MD, Pitigoi D, Arama V, Luminos ML, Jugulete G et al. Vaccination and factors related to the clinical outcome of COVID-19 in healthcare workers- a Romanian front-line hospital's experience. *MDPI – Vaccines*. 2023;11(5):899. doi: 10.3390/vaccines11050899
2. Böing CW, Froböse NJ, Schaumburg F, Kampmeier S. Impact of the COVID-19 Pandemic on the Management of Staphylococcus aureus Bloodstream Infections in a Tertiary Care Hospital. *Pathogens*. 2023 Apr 18;12(4):611. doi: 10.3390/pathogens12040611. PMID: 37111497; PMCID: PMC10143185.
3. Pitigoi D, Sandulescu O, Craciun MD, Draganescu A, Jugulete G et al. Measles in Romania – clinical and epidemiological characteristics of hospitalized measles cases during the first three years of the 2016-ongoing epidemic. *Virulence*. 2020;11(1):686-94. doi: 10.1080/21505594.2020.1771948
4. Cusumano JA, Dupper AC, Malik Y, Gavioli EM, Banga J, Caban AB et al. Staphylococcus aureus Bacteremia in Patients Infected With COVID-19: A Case Series. *Open Forum Infectious Diseases*. <https://academic.oup.com/ofid/article/7/11/ofaa518/5975147> by guest on 05 June 2023
5. Adalbert JB, Varshney K, Tobin R, Pajaro R. Clinical outcomes in patients co-infected with COVID-19 and Staphylococcus aureus: a scoping review. *BMC Infect Dis*. 2021;21:985. doi: 10.1186/s12879-021-06616-4
6. Jugulete G, Pacurar D, Pavelescu LM, Safta M, Gheorghe E, Borcos B et al. Clinical and evolutionary features of SARS CoV-2 infection (COVID-19) in children, a Romanian perspective. *Children*. 2022;9:1282. doi: 10.3390/children9091282
7. Jugulete G, Luminos M, Pavelescu C, Merisescu M. Remdesivir Efficacy and Tolerability in Children with COVID-19-Associated Allergic Comorbidities such as Asthma, Allergic Rhinitis, and Atopic Dermatitis. *Children*. 2023;10(5):810; doi:10.3390/children100508
8. Leonard Nastase, Luiza Radulescu, Monica Luminita Luminos, Maria Madalina Merisescu, Gheorghita Jugulete, Silvia Maria Stoicescu. Severe modifications of biological markers in late neonatal sepsis in a very low birth weight due to *Candida lusitanae*. *Revista de Chimie*. 2019;70(2):393-7. [www.revistadechimie.ro](http://www.revistadechimie.ro)
9. Merişescu M, Jugulete Gh, Osman E, Schiopu S, Florea D, Streinu-Cercel A, Luminos M. Severe sepsis with MRSA in an infant with aplastic anemia. Case report. *Revista Monduzzi Editore, International Proceedings Division*, May 2014, p. 63-67. [www.medimond.com](http://www.medimond.com)
10. Merisescu M, Jugulete G, Luminos M et al. The role of PLEX-ID in diagnosing multiple etiology systemic bacterial infections - case presentation, 8<sup>th</sup> World Congress of the World Society for Pediatric Infectious Diseases (WSPID), 2014, p. 69-74.
11. Silvia Maria Stoicescu, Ramona Mohora, Monica Luminos, Madalina Maria Merisescu, Gheorghita Jugulete, Leonard Nastase - PRESEPSIN - New Marker of SEPSIS Romanian Neonatal Intensive Care Unit Experience. *Revista de chimie*. 2019;70(8):3008-13. [www.revistadechimie.ro](http://www.revistadechimie.ro)