

Determination of the Risks of Clinical Variants Occurrence Covid-19 Course and Complications in Pediatric Cancer Patients

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Objective

The SARS-CoV-2 pandemic is a significant problem for oncologists, since COVID-19 disease has several clinical courses and is generally the biggest threat to patients with decreased immune reactivity, which the cancer patients are.

Intensive therapy, which the pediatric cancer patients receive, leads to the significant decrease of immune functions. Despite the international pediatric communities have implemented urgent information and guidance measures to support patients with pediatric cancer, the impact of SARS-CoV-2 on these patients shall be researched.

Thus, the goal of the planned research is:

- Research of the oncological pathology structure in pediatric patients of hematological hospitals with COVID-19
- Identification of variants of the clinical course of COVID-19 and risks of occurrence of variants of the COVID-19 disease course, including the asymptomatic course
- Research of the complications nature that are most often occurred in pediatric cancer patients due to the SARS-CoV-2 infection and risks of their occurrence in patients with pediatric cancer, depending on the type of malignant process.

Methods

Multicenter prospective research was carried out as a result of which 46 pediatric oncological patients at pediatric oncohematological departments of Ukrainian regions were supervised.

According to the clinical course of patients from the researched group, patients with asymptomatic course, patients with the mild course, patients with moderate to severe COVID-19 course were stratified.

The asymptomatic group included children who had a positive SARS-CoV-2 PCR test and did not have any other disease signs. The group of patients with mild course included children who had the following symptoms: hyperthermia (up to 38°C), runny nose, cough without respiratory failure signs, absence of symptoms of gastrointestinal disorders (nausea, vomiting and/or diarrhea), absence of mental state changes (disorders of consciousness, lethargy). Patients who had shortness of breath and labored respiration; increased in respiratory movements frequency of more age-related physiological norm; symptoms of gastrointestinal disorders; changes in mental state (mental confusion, inhibited thinking) are attributed to the group with moderate to severe and severe course.

For the purpose to identify the risks of developing one of the clinical variants of the COVID-19 disease course among patients with pediatric cancer, they were divided into subgroups: patients with the haematopoietic and lymphoid malignancies and cancer patients with solid tumors. The χ^2 criteria was used to determine the differences between groups of children. Statistically significant difference was considered at the p value of ≤ 0.05 . Statistical calculations were carried out using the STATA 16.1 software license package.

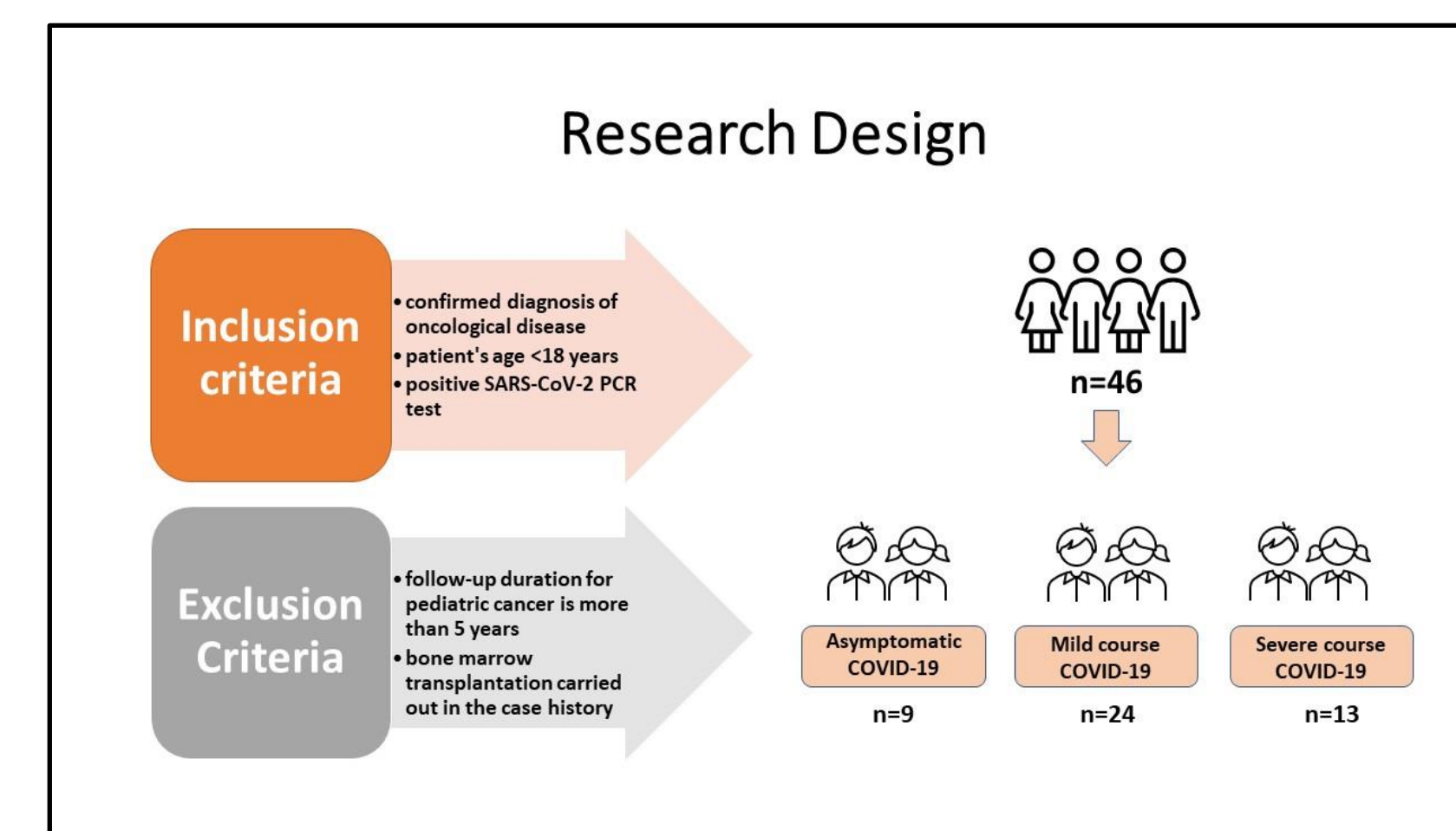


Figure 1. Research Design.

The inclusion criteria for the research were: confirmed diagnosis of oncological disease, patient's age <18, with positive SARS-CoV-2 PCR test.

Exclusion criteria from the research: follow-up duration for pediatric cancer is more than 5 years; bone marrow transplantation carried out and available in the case history.

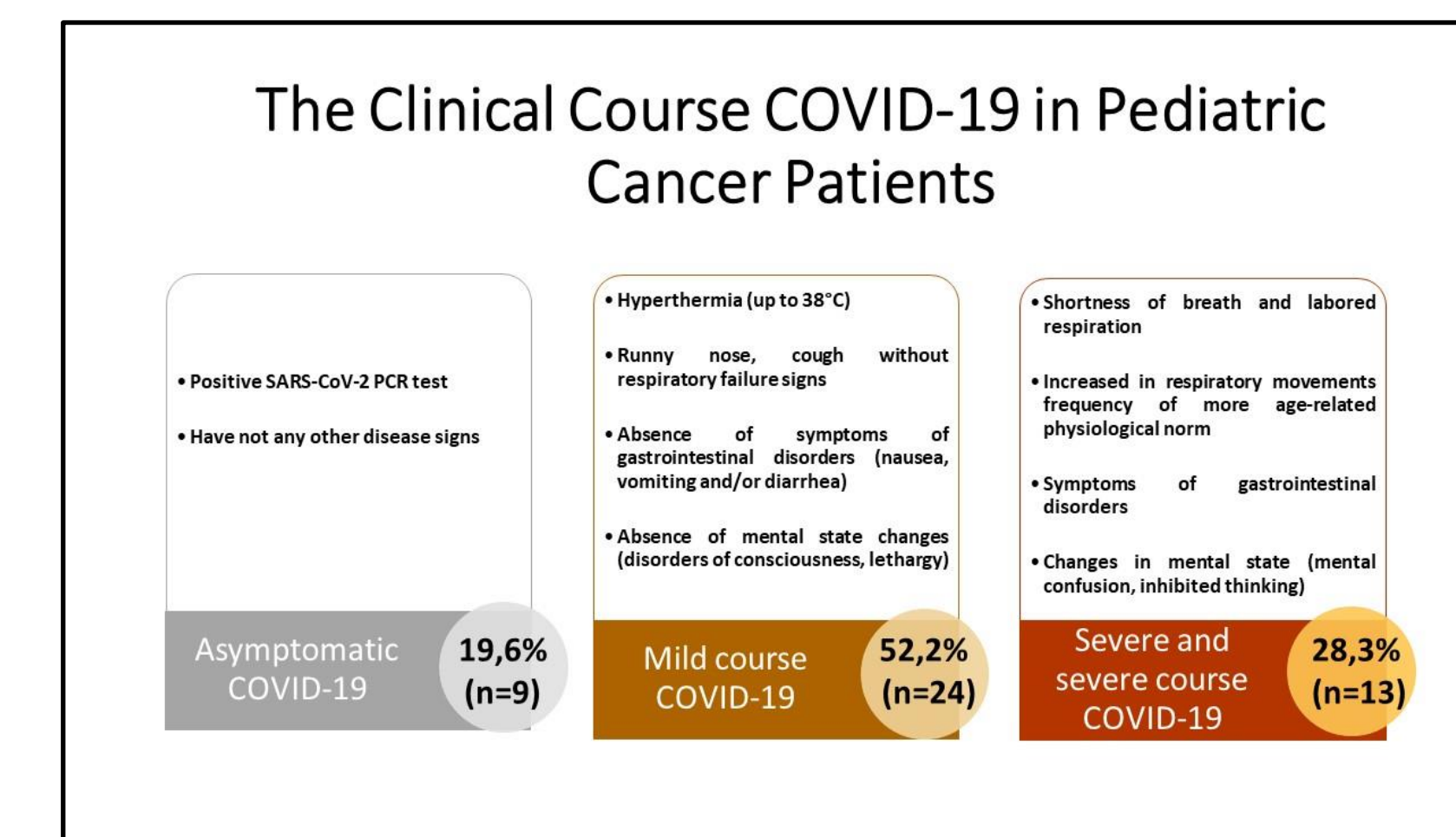


Figure 2. The Clinical Course COVID-19 in Pediatric Cancer Patients

Asymptomatic course in case of positive SARS-CoV-2 PCR test – 19.6% (n = 9); 52.2% of patients had mild course; 28.3% of children in the research group had a moderate and severe course of COVID-19, for 1 patient severe course of the disease ended fatally through the development of complications resulting from the SARS-CoV-2 infection.

Results

The research group included 46 patients with pediatric cancer, 1 patient of which died due to the development of complications against the background of severe course of COVID-19, and 2 patients died due to the progression of the underlying prior disease. Thus, the overall survival in the research group is 93.5%; the mortality in this group was 6.5%; the case fatality rate from COVID-19 among patients with pediatric cancer was 2.2%. Taking into account that this research is cross-sectional and has a small number of patients, it is not possible to research the overall survival as well as the mortality in more detail.

According to the clinical course of COVID-19, the following variants of the course of the disease have been identified: asymptomatic course in case of positive SARS-CoV-2 PCR test – 19.6% (n = 9); 52.2% of patients had mild course; 28.3% of children in the research group had a moderate and severe course of COVID-19, for 1 patient severe course of the disease ended fatally through the development of complications resulting from the SARS-CoV-2 infection.

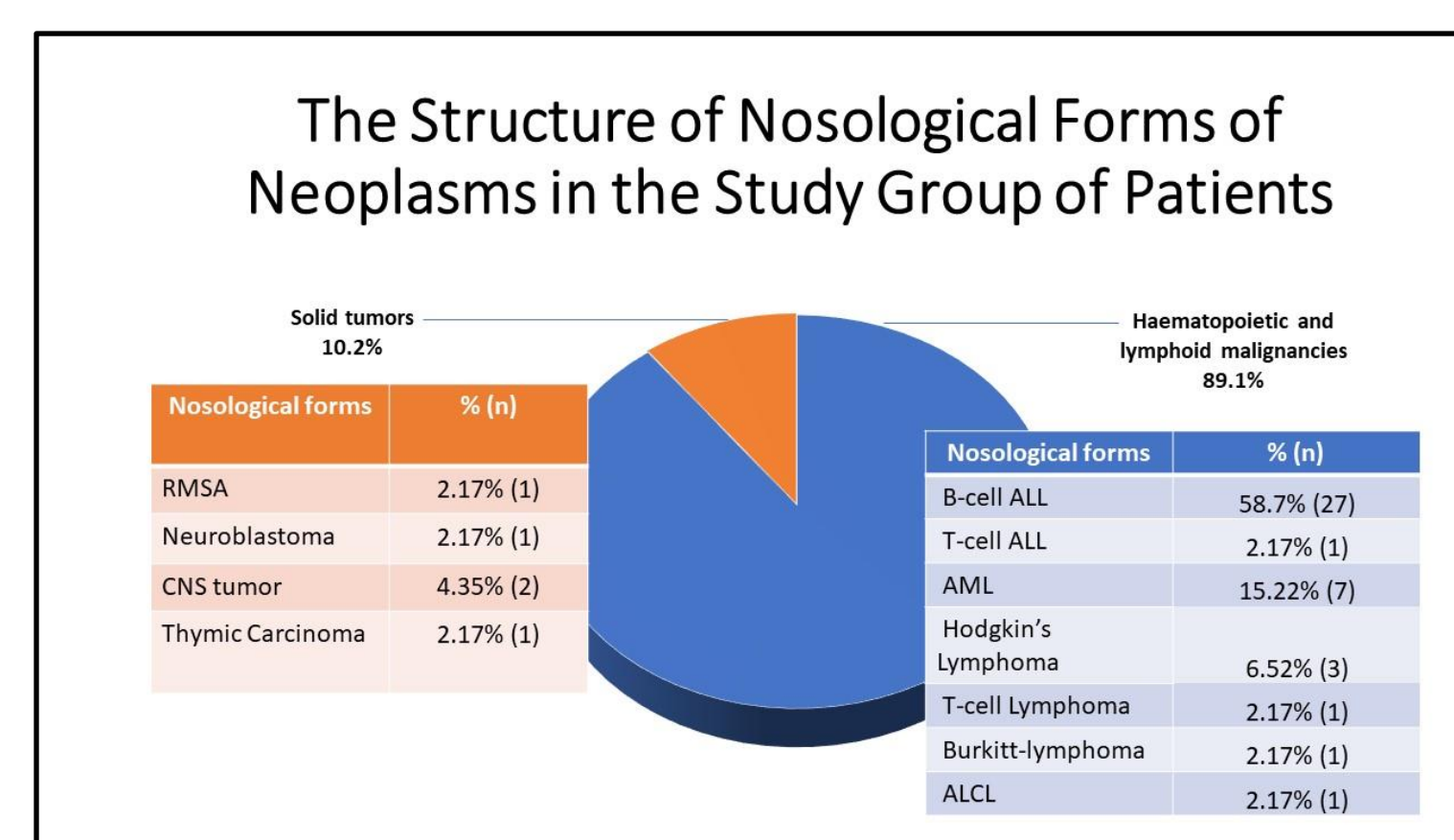


Figure 3. The Structure of Nosological Forms of Neoplasms in the Study Group of Patients.

The 89.1% of patients had leukemia in the research group (acute lymphoid leukemia among them): B-cell leukemia – 58.7%; T-cell leukemia – 2.2%; acute myeloid leukemia – 15.2%, 13% of patients with Lymphomas; 10.9% of patients had solid tumors.

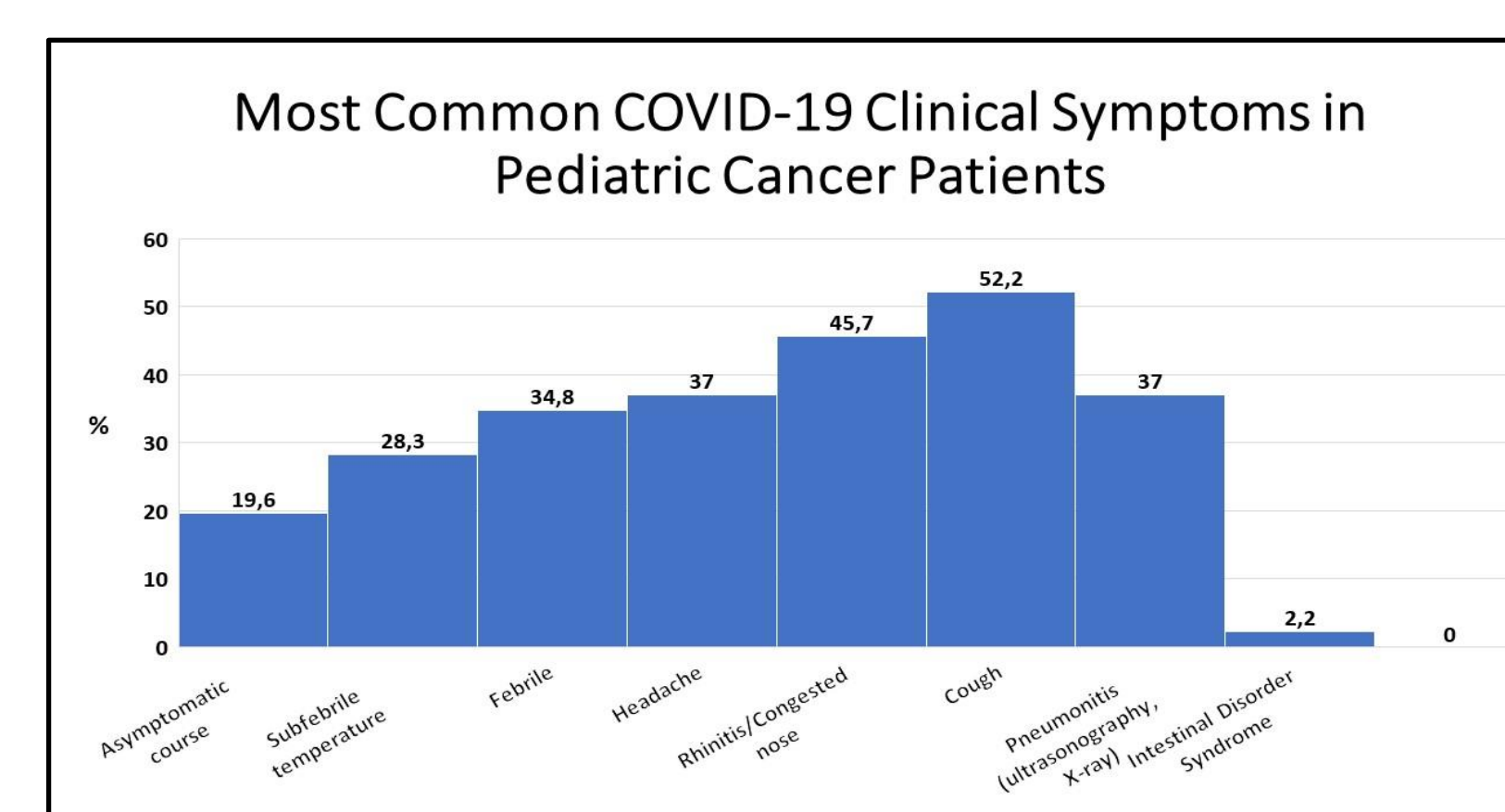


Figure 3. Most Common COVID-19 Clinical Symptoms in Pediatric Cancer Patients.

Due to the features of the infectious process course and presence of oncological pathology in the patient, it was rather difficult to differentiate such a symptom as fever and its correlation with SARS-CoV-2 infection or septic complications in the patient.

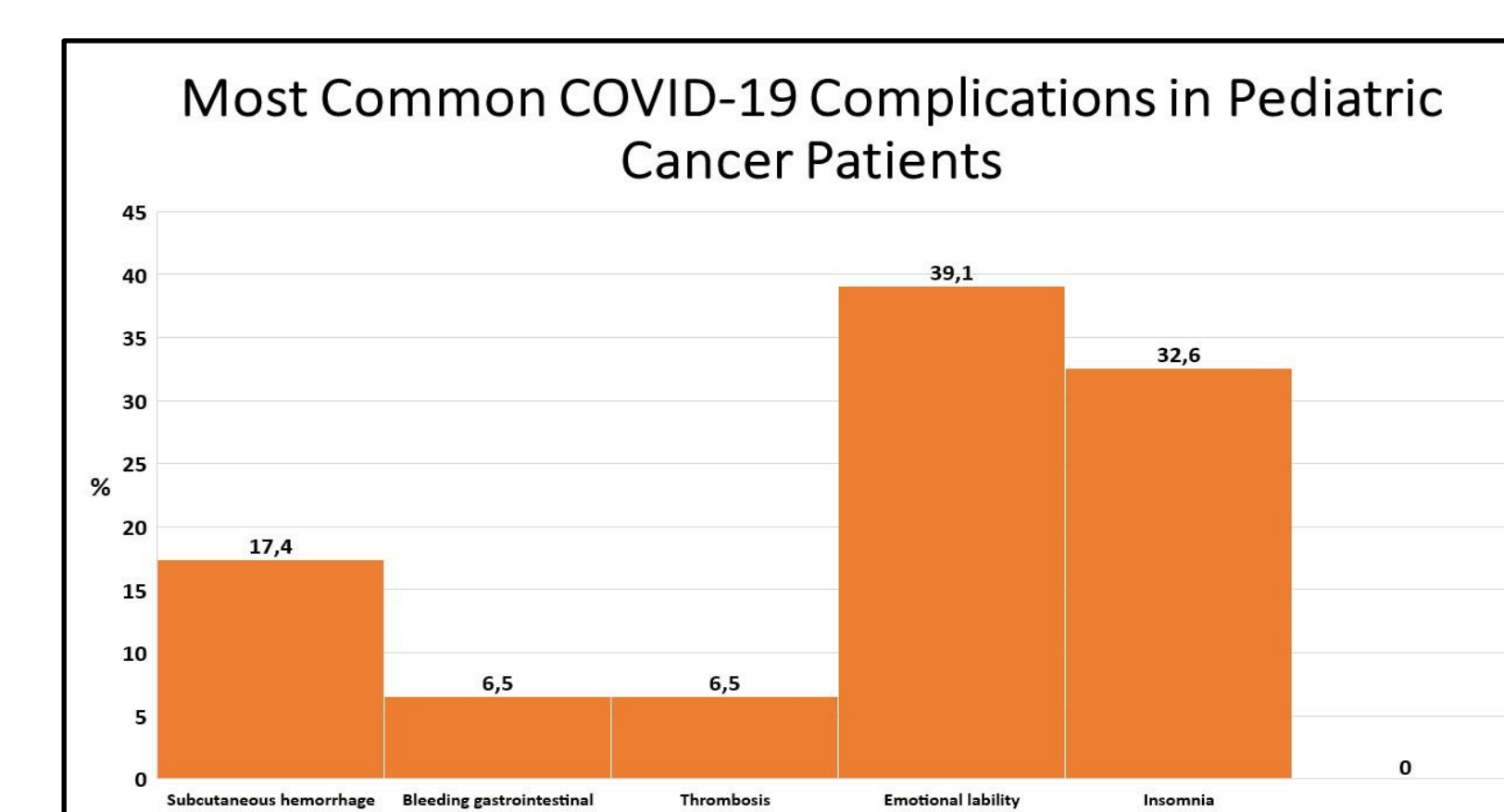


Figure 4. Most Common COVID-19 Complications in Pediatric Cancer Patients.

With reference to hemorrhagic syndrome, 8 patients (17.4%) had subcutaneous hemorrhage, 3 patients (6.5%) had bleeding, including with the development of disseminated intravascular coagulation (DIC), for one patient it ended fatally.

Conclusions

- We found that presence of tumor with the haematopoietic and lymphoid malignancies in pediatric oncological patients is not a risk factor for severe or mild course of COVID-19 disease, and does not differ from the COVID-19 course in patients with solid tumors.
- The most frequent complications resulting from SARS-CoV-2 infection were behavioral disorders were the most frequent in the research group, reflected by prolonged emotional lability and aggressiveness towards others (39.1% of the researched, n = 18); as well as sleep disorders, which were diagnosed in 32.6% of patients (n = 15). During the assessment of the risk of complications arising in case of SARS-CoV-2 infection if there is a tumor with the haematopoietic and lymphoid malignancies is also not greater than in such children with solid tumors.

Key words

Coronavirus disease 2019, childhood cancer, mortality, case fatality rate