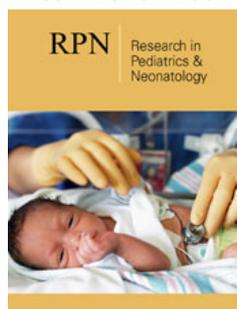


Structure of Neurological Complications in Children with Covid-19: A Mini-Review and Own Experience

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Abstract

Aim: Aim of this study was to investigate the features of neurological symptoms in pediatric patients hospitalized during the COVID-19 pandemic in 2020-2022 and to analyze similar symptoms according to the literature. We retrospectively investigated 945 cases of the disease in children aged from birth to 17 years, who were hospitalized in KCCCIDH in Kyiv, Ukraine with a diagnosis of coronavirus in the period from June 2020 to February 2022. Among them, cases with neurological symptoms were analyzed. Peculiarities of the clinical picture and results of laboratory researches were determined. To conduct a statistical study of the results, we used the statistical package Statistical software EZR v. 1.54.

Results: Neurological symptoms were observed in 142 (15%) patients. Of these, the most numerous was the group of children aged 10 to 18 years, was 55.6% (79/142). The leading neurological symptoms in children were headache (11.7%), ageusia, anosmia (7%), convulsive syndrome (1.2%), acute polyneuropathy (1.2%) and myalgia/arthritis (3.7%). Among the laboratory data, we found prognostic value for the appearance of neurological symptoms in leukocytes (0.706; 95% CI 0.443-1.124), C-reactive protein (0.708; 95% CI 0.410-1.220) and procalcitonin (0.33; 95% CI 0.21-0.47).

Conclusion: Neurological symptoms are a common manifestation in children in the acute period of coronavirus disease. Further monitoring and control studies are needed to cover the acute onset of neurological symptoms, the results of the neurological examination, the rate of progression and the long-term consequences of nervous system disorders in children with COVID-19.

Keywords: Coronavirus infection; Children; Neurological disorders; Complications

Introduction

The relevance of this research is due to the increasing frequency of complicated cases of coronavirus infection (COVID-19) among children. During the COVID-19 pandemic, there was a rapid increase in the incidence of neurological lesions. The structure of neurological manifestations of coronavirus disease among adult patients is up to 82% and is represented in the acute period by fatigue (32%), myalgia (20%), olfactory and taste disorders (21%), headache (13%), delirium and convulsions (34%). Patients are also diagnosed with stroke in 2% of cases, meningoencephalitis and Guillain-Barre syndrome in 10% of cases [1,2]. Clinical symptoms in patients may manifest in the post covid period in the form of fatigue (63%), myalgia (63%), sleep disorders (26%), anxiety disorders and depression (23%), difficulty concentrating (24%), headache (13%), dizziness (12%), confusion (11%), nervous excitement (45%) and cognitive impairment (15%) [3]. Also, numerous neurological and mental disorders are observed even six months after coronavirus disease.

According to published studies, which analyzed more than 230,000 patients, the incidence of neurological and psychiatric diagnoses in patients after COVID-19 in the next 6 months was more than 33%, with almost 13% of cases diagnosed for the first time. In patients treated with

ICU, this incidence was 46.42% and was represented by intracranial hemorrhage, ischemic stroke, parkinsonism, dementia, psychotic and anxiety disorders [4]. Among the pediatric population, this aspect of COVID-19 remains poorly understood. According to available meta-analyses and literature data, the most numerous symptoms of central nervous system damage are headache (61%), encephalopathy (15.3%) and pyramidal symptoms (7.6%). Symptoms of peripheral nervous system disorders include muscle weakness (61.5%), hypo/areflexia (23%), ageusia (15.3%) and anosmia (7.6%). Guillain-Barre syndrome in children is described with a frequency of 15 cases per 100 thousand population, and seizures in 20-30% [5-7]. The aim of this study was to investigate the features of neurological symptoms in pediatric patients hospitalized during the COVID-19 pandemic in 2020-2022 and to analyze similar symptoms according to the literature.

Materials and Methods

We retrospectively investigated 945 cases of the disease in children aged from birth to 17 years, who were hospitalized at the Kyiv City Children's Clinical Infectious Diseases Hospital (KCCCIDH) in Kyiv, Ukraine with a diagnosis of coronavirus in the period from June 2020 to February 2022. Among them, cases with neurological symptoms were analyzed. Peculiarities of the clinical picture and results of laboratory researches were determined. To conduct a statistical study of the results, we used the statistical package Statistical software EZR v. 1.54.

Research Results

Among this cohort of children, neurological symptoms were observed in 142 (15%) patients. Of these, the most numerous was the group of children aged 10 to 18 years, was 55.6% (79/142). The leading neurological symptoms in children were headache, observed in 11.7% of cases and its duration ranged from 1 to 14 days (median-2 days). Symptoms of ageusia, anosmia were observed in 8.1%, of which in 98.4% of cases were in children older than 10 years. The mean age of patients with anosmia / ageusia was 14.9 years. The duration of these symptoms was from 2 to 14 days (median-7 days). Convulsive syndrome was observed in 1.2% of children, the duration ranged from 1 to 4 days (median-1 day). Acute polyneuropathy was observed in 1.2% of patients with a mean duration of 5 to 10 days (median-7 days), myalgia/arthritis in 3.7% of children with a mean duration of 1 to 15 days (median-4 days). It should be noted that in children under 1 year of age the symptoms of headache, anosmia and ageusia were not determined. In all these cases, there was a rapid recovery of neurological dysfunction with complete clinical recovery at the time of discharge.

The ratios of the chances of developing neurological symptoms depending on clinical syndromes and laboratory parameters were

also analyzed. Among respiratory syndromes, the presence of cough (0.781; 95% CI 0.505-1.207) and signs of lower respiratory tract injury (1.305; 95% CI 0.829-2.055) were associated with a higher risk of neurological symptoms. At the same time, the presence of shortness of breath (0.582; 95% CI 0.199-1.703) was accompanied by a lower frequency of neurological symptoms. Among the laboratory data, we found prognostic value for the appearance of neurological symptoms in leukocytes (0.706; 95% CI 0.443-1.124), C-reactive protein (0.708; 95% CI 0.410-1.220) and procalcitonin (0.33; 95% CI 0.21-0.47). In this case, if the increased level of leukocytes in the peripheral blood was associated with an increase in the frequency of neurological symptoms, in groups of patients with elevated levels of C-reactive protein or procalcitonin, in contrast, there was a lower frequency of neurological symptoms.

Conclusion

Neurological symptoms are a common manifestation in children in the acute period of coronavirus disease. Elevated procalcitonin levels are associated with a higher frequency of neurological symptoms. The prognostic factors for the appearance of neurological symptoms in COVID-19 in children include the older age of the child, the presence of cough and symptoms of lower respiratory tract lesions, as well as elevated white blood cell counts. Further monitoring and control studies are needed to cover the acute onset of neurological symptoms, the results of the neurological examination, the rate of progression and the long-term consequences of nervous system disorders in children with COVID-19.

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