COVID-19 Infection in Children

Subjects: Pathology

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A descriptive synthesis was performed to evaluate recent insights and the effectiveness of therapies for SARS-CoV-2 infection in children, infants and pregnant subjects. Results: Insufficient data are available regarding the relationship between COVID-19 and the clinical risk of spontaneous abortion and premature foetus death. A decrease in the incidence of COVID-19 could be correlated to a minor expression of ACE2 in childrens' lungs.

Keywords: SARS-CoV-2 ; coronavirus-19 ; therapy ; pandemics ; children ; pregnant

1. Introduction

Some studies conducted from the 1st of January to the 21st of April 2020 on COVID-19 paediatric patients showed some clinical manifestations: fever (46%) and cough (42%), and diarrhoea, vomit, nasal congestion and fatigue represented 10% in hospitalised paediatric patients. In the laboratory analysis, values reported leukopenia (21%), lymphocytosis (22%), high aspartate aminotransferase (19%), lymphopenia (16%), high alanine aminotransferase (15%), high levels of reactive C-protein (17%), leucocytosis (13%), high D-dimers (12%) and high creatine kinase-MB (5%). The interest of the thorax in the radiographic analysis, unilateral and bilateral, respectively represented 22% in hospitalised paediatric patients. In conclusion, the hospitalised paediatric patients showed slight clinical symptoms, indicators of laboratory tests and features of thorax imaging [1]. In another study of 624 paediatric patients with COVID-19 confirmed by laboratory test, the change in the percentage of leukocytes was only present in 32% of slight paediatric patients, and in these patients creatine kinase MB (CK-MB) was often high. In severe disease, C-reactive protein (CRP), procalcitonin (PCT) and lactate dehydrogenase (LDH) were frequently high. According to these data, the values of leukocytes in babies are not reliable, unlike what has been noted in adults who usually show a leukocyte increase [2]. By considering the data in these cases, systemic inflammation rarely occurs in paediatric patients with COVID-19, in contrast to the lymphopenia and the important and severe inflammatory responses which have been frequently observed in adults with COVID-19. Since the first cases of COVID-19 some cardiovascular events have been reported, among which there are myocarditis, stress cardiomyopathy, myocardial infarction and arrhythmia; through the severity of the critical disease, rather than the lesion of the myocardium from viral particles [3]. Some information on the prevalence of post-COVID-19 complications in young athletes have been obtained [4][5][6]. The use of HMR in athletes after COVID-19 infection, independently on heart symptoms or other heart tests (ECG, echocardiogram and the results of troponin), has an increase of 2.3%, namely 7.4 times the diagnosis based on the symptoms and 2.8 times a screening based on ECG, echocardiogram and troponin [7].

Neurological complications in babies < 18 years affected by COVID-19 are quite frequent: cephalea (4%), anosmia (2%), convulsions (0.7%) and cerebrovascular stroke (0.7%) [8][9].

In adaptive immunity, the cell system activates its functions after the first years of life so that the humoral response improves perfectly after 10 years. A possible explanation for the slight symptoms in babies is surely the perfect innate immunity of this age. Another important result introduced by Dong et al., is that the most severe conditions have occurred in babies aged less than 1 year. This may also be explained by the development of the innate response of this age group, which becomes more effective after the first six months of life [10]. In a study on 32 adults and 47 babies, aged equal to or less than 18 years, it was found that babies mainly produced antibodies directed to the spike protein of SARS-CoV-2, which is useful for the virus to enter cells. Adults produced similar antibodies, but also produced antibodies against the nucleocapsid protein, essential for viral replication and mainly released only when the virus spreads in the whole body. Immune responses in babies seem to be able to eliminate the virus before its spreading [11]. The ability to eliminate the virus in babies may also be related to the fact that they have a great innate immune response from their birth [12]. Babies did not have specific antibodies for the nucleocapsid. This suggests that they are not spreading a living infection, Farber says. The immune response of babies seems to be able to eliminate the virus before its replication.

The regenerative process in babies may represent the key factor which explains their immunity to COVID-19 [13].

2. Pregnancy

Despite there being a low possibility of vertical transmission, a baby whose mother is positive to COVID-19 may have adverse responses, such as foetal distress, preterm birth, respiratory difficulty and death [14].

Pregnant women are particularly susceptible to respiratory infections and severe pneumonia, because of the physiological changes due to pregnancy (elevation of diaphragm, higher use of oxygen and oedema of the mucosa of the respiratory tract) and their immunosuppressive condition [15].

It was also noted that perinatal 2019-nCoV infection may have negative effects on newborns, by causing problems such as foetal distress, premature birth, respiratory difficulties, thrombocytopenia with altered liver functionality, and death [16] [17].

It would seem that when the infection occurs during the third trimester of pregnancy, it may increase the risk of premature rupture of membranes, preterm birth, foetal tachycardia and foetal distress.

3. Tocilizumab

Tocilizumab is a recombinant humanised monoclonal antibody which belongs to immunoglobulin G1 and acts against IL-6 receptors, both soluble and membrane [18].

This drug is already used in the paediatric population for the treatment of moderate and severe rheumatoid arthritis, systemic juvenile idiopathic arthritis (for 1 year), juvenile idiopathic polyarthritis (for 2 years) and severe CAR T cell-induced cytokine release syndrome (T-cell of the chimeric antigen receptor) (for 2 years) [19].

(2) Second infusion: 12 h after the first one (according to medical advice, in the case of no response).

Data from the literature reports that most SARS-CoV-2 infections in babies have a benign trend. Pharmacological treatment, without support therapy, may only be considered for more severe cases.

4. Babies and Teenagers

For all four vaccines: Pfizer-BioNTech, Moderna, AstraZeneca and Johnson & Johnson, currently, administration is not provided to babies and teenagers.

European and American paediatric regulations provide two age groups for the trial of all vaccines tested in paediatric ages: from 0–11 years and 12–17 years.

The multinationals of Big Pharma announced the 100% efficacy of the vaccine in preventing symptomatic disease, and it triggered a stronger immune response than that observed in young adults, aged 12–15 years.

In this study 16 cases of COVID-19 were reported, all were among the 978 who received the placebo with no case in the group of 1005 who received the vaccine [20].

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