

Immune Response and Susceptibility to SARS-CoV2 Virus in Children

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Abstract: The COVID-19 disease that was first discovered in Wuhan-China province, also called severe acute respiratory syndrome, is a serious public health concern in the 21st century. This disease affects the respiratory system and its causal agent is the SARS-CoV2 virus, which is part of the family of beta-corona viruses that many associate with the bat. This virus not only affects the population that is considered vulnerable but also affects young adults and children. The objective of the present review is to describe the characteristics of the immune response and susceptibility in children with SARS-COV2. We examined articles in the Elsevier, Google Scholar, PubMed and Scielo databases regarding the immune systems of children with the disease of COVID-19 and the physio-pathological mechanisms of SARS-CoV2 that contribute to illness in this population. Although the capacity of infection of SARS-CoV2 in children is very high, the mechanism of the virus against pathogenicity in this population group is not clear.

The objective of the present review is to describe the characteristics of the immune response and susceptibility in children with SARS-COV2

Keywords: COVID-19, SARS-CoV2, Immunity, Infection, Cytokines, Pathogenicity.

INTRODUCTION

Among the diseases that have gained importance in the 21st century, is the respiratory disease caused by the SARS-CoV2 virus, and called severe acute respiratory syndrome or COVID-19, which was first discovered in December 2019, in the province of Wuhan-China [1, 2]. The corona viruses are viruses belonging to the family Coronaviridae, which in turn is divided into two subfamilies which are the Orthocoronavirinae and Torovirinae. This first subfamily is divided into four genera which are the alphacoronavirus, betacoronavirus, gammacoronavirus and deltacoronavirus. Generally, coronaviruses are not causal agents of respiratory diseases, but in the last 20 years, these first two genera have caused respiratory infections in humans, such as pneumonia and bronchitis, and gastrointestinal diseases, such as SARS-CoV and SARS-CoV2, which have become fatal [3, 4].

On the other hand, SARS-CoV2 and SARS-CoV, are similar in terms of pathogenicity, symptomatology, epidemiology and other pathological characteristics; as for the SARS-CoV2 genome, it is evident that it presents a high sequence similarity with SARS-CoV, which in relation to the genomic sequence of the virus (MERS-CoV). All these viruses are causal agents of diseases that are transmitted from animals to humans

called "zoonotic diseases" and that have as a reservoir an animal species, however for SARS-CoV2 its reservoir is still unknown, although it has been speculated that it is the bat, this has not yet been confirmed [5].

The population at risk of contracting COVID-19 are: young adults (27 -59 years old), the elderly (60 or more years old), people with co-morbidities (kidney failure, anemia, diabetes, peripheral arterial disease, cerebrovascular disease and chronic lung disease (COPD), people with diseases of the immune system (immunosuppressed), and children due to the rapid spread of the virus. As for the behavior of the symptoms in pediatric patients, it is evident that they may or may not present them, nevertheless, the symptoms that may develop are: fever, dry cough, congestion and dyspnea, it is worth noting that these symptoms are mild and tend to have a lower rate of hospitalization. Compared to the adult population, the difference in terms of symptoms is related to the capacity of response of the immune system, the difference in the expression of the receptor of the angiotensin converting enzyme (ACE) and its distribution; as well as the low capacity of union of this one with the virus, since it is necessary for the infection by SARS-CoV2 to be presented [1, 2, 6, 7]. Within the immunological response by adults, and in relation to children, it is seen an increase of lymphocyte type cells CD4 and CD8, additionally it has been demonstrated that children infected with SARS-CoV2 present neutrophilia, increase of C-reactive protein, procalcitonin, ferritin and interleukins IL-6, IL-8, IL-10,

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however; the mechanism of action of this virus in children has not been fully described [8]. Therefore, the objective of the present review is to describe the characteristics of the immune response and susceptibility in children with SARS-COV2.

MATERIALS AND METHODS

A review of the literature on the immune system of children with COVID-19 was conducted in the Elsevier, Google scholar, PubMed, Scielo databases. Each of the databases was searched, using the possible combinations with English keywords (COVID-19, SARS-CoV2, children, immune system, pediatrics) using the Boolean operators AND and IN. A date limit was set for publications between January 1 2020 and December 31 2020, considering original research or review articles, available in English or Spanish.

Observational studies, case reports on the immune system of children with COVID-19 were included, as well as information on the physiopathology of SARS-CoV2 virus, the mechanism of the angiotensin converting enzyme 2 (ACE2) receptor and structural and molecular characteristics of SARS-CoV2. For the realization of this revision and the selection of bibliographic references, there were taken into account

selection and exclusion criteria of the articles, inside the selection criteria there were included: articles published in 2020, having data related to COVID-19 immunopathogeny in children, ACE2 receptor mechanism, SARS-CoV2 immunopathology, being written in Spanish or English for this included 50 articles (40 in English and 10 in Spanish) and inside the exclusion criteria there were taken into account: Articles that will present information on COVID-19 in adult and young adult population, thesis or graduate work, articles that are not written in Spanish or English and articles that were not free access excluding 20 articles of a total 70 articles; in the relation with the information geographic of the studies, it is present in the Graph 1.

The methodology used in most of the articles was the study of cases in the age groups of 0 to 17 years old, it being an under-studied population, the information found so far was limited, however in the search for the articles were found 3 studies whose methodology was a collection of literature regarding the immune and susceptible response in children with SARS-CoV2.

In all studies, the population studied were children, *i.e.* early childhood (0-5 years), childhood (6 - 11 years)

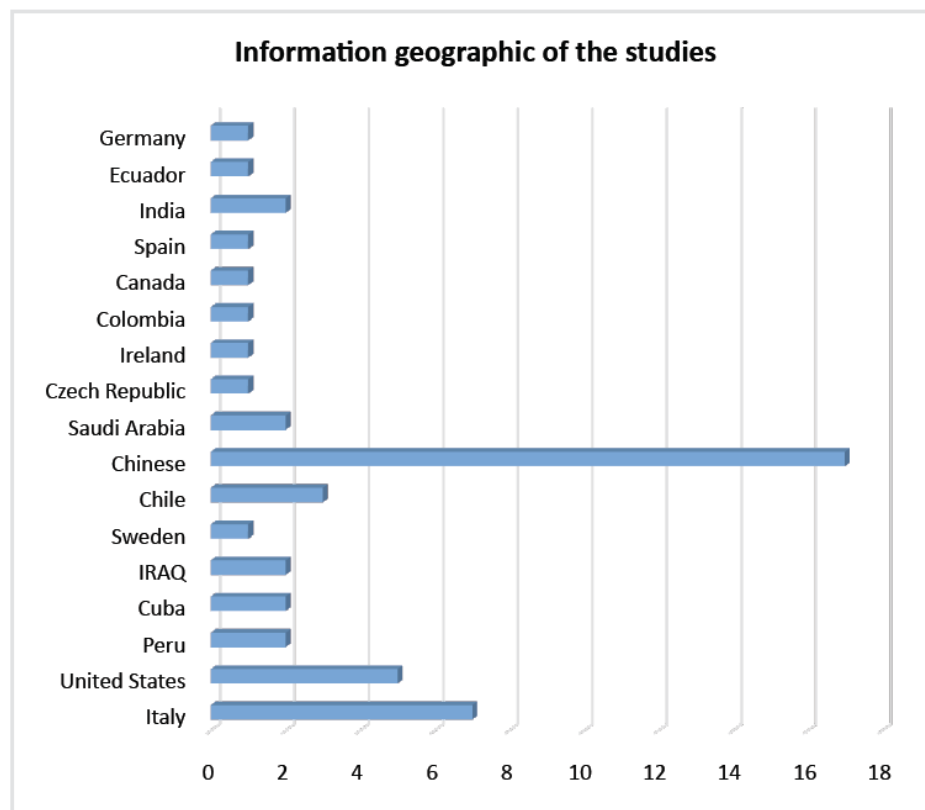


Chart 1: Geography to the studies included in this review.

and adolescence (12-18 years); for categorization between children and adults in all studies were based on the ages of the patients, however, the population with the highest number in the revision performed, it was the population between 0 and 11 years, in addition to this so that the population were part of each of these studies was necessary the presentation of COVID-19 disease.

RESULTS AND DISCUSSION

SARS-CoV2 Characteristics

The coronaviruses are viruses that are widely distributed in nature, infecting both mammals, birds and humans, being animals the main reservoir, therefore they are diseases [6, 9, 10]. The SARS-CoV2 is a virus of the genus beta-coronavirus, the genetic material is described as single stranded RNA of positive sense and wrapped, besides its name of coronavirus is given by the tips present around the virus that give it a crown aspect, these tips correspond to the spike glycoproteins (S) distributed in the viral surface, which include the domains S1 and S2 that is one of the 4 main structural proteins of this virus; Regarding the role of the S-glycoprotein (Skip Protein) and its domains facilitate the binding of SARS-CoV2 to the cell receptor, the protein (M) is important since it helps to maintain the structure of the membrane and the binding with the nucleocapsid, the protein (E) is fundamental in the assembly and release of SARS-CoV2, and finally the protein (N) is part of the viral genetic material and is part of the nucleocapsid [11, 12] (Figure 1).

ACE2 Receiver Mechanism

The SARS-CoV2 virus requires the angiotensin-converting enzyme 2 (ACE2) receptor, which is part of the dualrenin-angiotensin system, and is expressed in cells such as arterial, venous, and arterial smooth muscle endothelial cells; in organs such as the heart, kidneys, pancreas, and in glands such as the adrenals. Similarly, in skeletal muscle and adipose tissues, since this receptor is fundamental for the entry and subsequent infection in the host generating the binding to the entry site, which is crucial for the appearance and progression of the COVID-19 disease [13]. In this way, the SARS-CoV2 virus has a tropism with the cells of the respiratory system, since, the ACE2 is expressed in high concentrations in the oral cavity, facilitating the entrance and later infectious process in the host [14]. Therefore, it facilitates the entry of the virus into the target cell, this in conjunction with the surface protein "S" (Spike Protein) present in SARS-CoV2, and the ACE2 receptor that is used as an entry mechanism and that employs the cell serine protease TMPRSS2, for entry into the respiratory system, in the case of people who have not been infected by SARS-CoV2, the ACE2 receptor is expressed in alveolar epithelial cells type I or II also known as pneumocytes, likewise, the ACE2 receptor is expressed in other organs such as The ACE2 receptor is also expressed in other organs, such as the heart, pancreas and kidneys, and in cells such as arterial and venous endothelial cells and arterial smooth muscle cells, as well as in glands such as the adrenal glands, in skeletal muscle and adipose tissues, which, when in contact with the virus, will facilitate the development of the ACE2 protein [2, 15, 16].

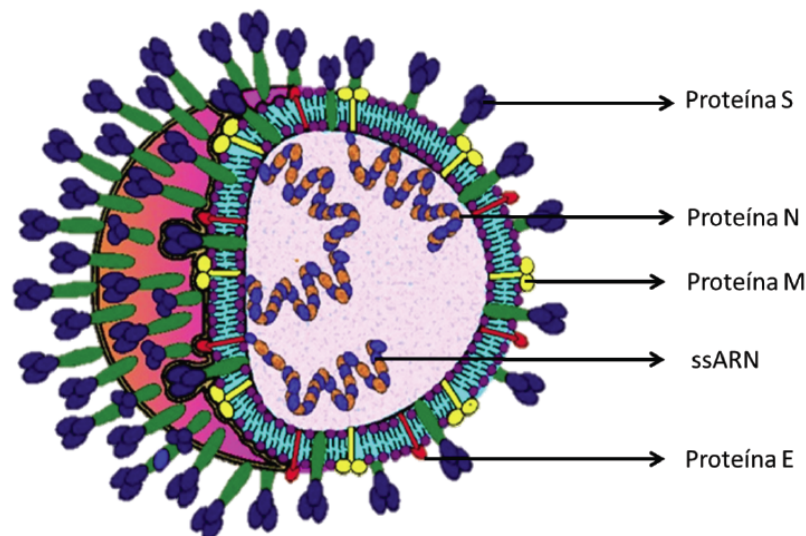


Figure 1: SARS-CoV2 structure.

Source: Own elaboration based on Grandy, G., Terán, C. G., Martínez, A., & Volz, A. (2020). Covid-19 Review Articles, a view from pediatrics. *Gac Med Bol*, 43.

The development, distribution and function of the ACE2 receptor in children may be different, since studies have shown that the intracellular response induced by ACE2 in alveolar epithelial cells in children is lower compared to adults, and the underlying comorbidity conditions are less common in the child population [17].

Physiopathology of SARS-CoV2

The mechanism of pathogenicity of SARS-CoV2 starts when the virus comes into contact with a healthy person, through droplets (from nasal and/or oral secretions), which serve as a vehicle of transmission. It should be noted that the virus can be transmitted by symptomatic or asymptomatic people and that the incubation period of the virus is 3 to 7 days (range 1-14 days); once the virus enters the body, it is necessary the contact with the receptor (ACE2), which is found in organs such as kidney, lung and heart in larger quantities, once the virus comes in contact with the respiratory tract, that is, with the lung it reaches the alveolar epithelium, joining the type II pneumocytes (expression of large amount of ACE2 receptors) through the surface protein "S" (skipe protein) of the

virus. The surface protein is composed by two domains S1 that binds to the cell receptor and S2 that is the mediator of cell fusion, triggering an inflammatory response and a cytopathic effect, leading to the destruction of the pneumocytes and initiating the process of viral replication [18, 19]. As a defense mechanism, the organism triggers an inflammatory response at the pulmonary level, not only by epithelial cells, but also by endothelial cells leading to vasodilation, increased exudate, *i.e.*, liquid excretion inside the alveoli, consecutively will trigger the characteristic symptomatology of COVID-19 disease, consisting of dry cough, dyspnea, respiratory difficulty (oxygen (O₂) has difficulty passing through alveoli with inflammatory processes) and finally an acute respiratory insufficiency of hypoxemic type (type 1); this process conduce to the disease denominated COVID 19 [20-22] (Figure 2).

Age is an important factor in the immune response against SARS-CoV2 with older adults being at greater risk as it causes a deregulation between Th1/Th2 profiles, which leads to critical respiratory complications and even an increase in mortality. However, in children, the response of cytokines is unclear [17, 23].

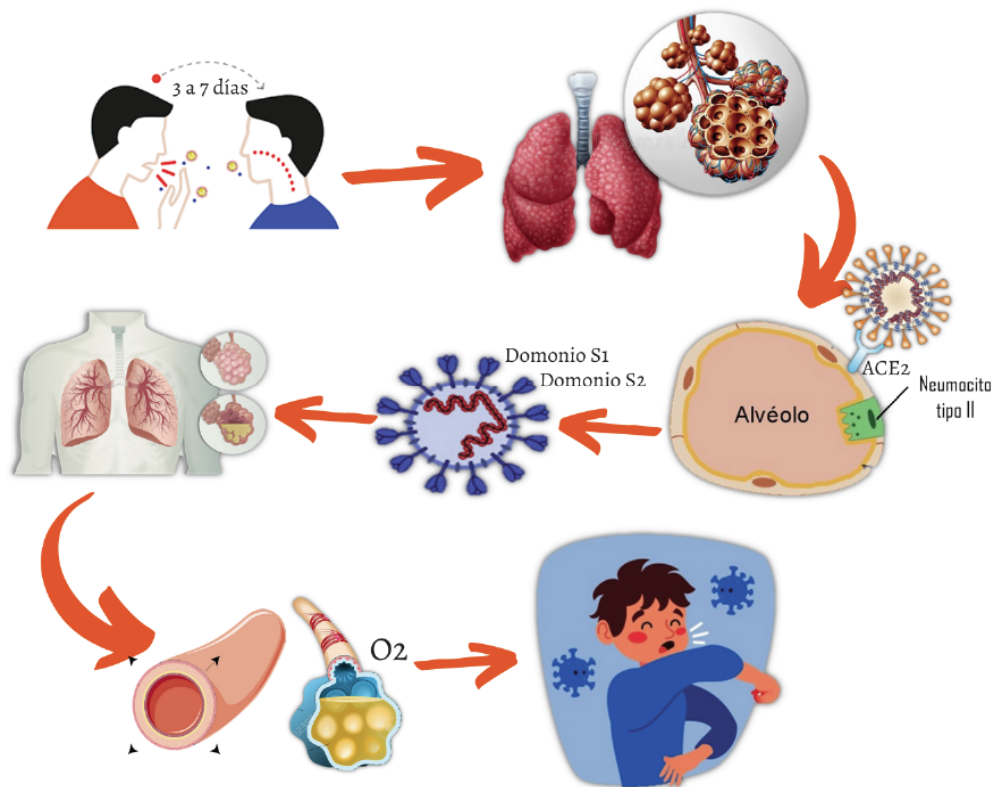


Figure 2: Pathophysiology of COVID-19.

Source: Own elaboration based on: Javier Díaz-Castrillón F, Toro-Montoya AI. Review article SARS-CoV-2/COVID-19: The virus, the disease and the pandemic Ed Médica Colomb SA.

Table 1: Principal Differences Between SARS-coV2 and COVID 19

SARS-CoV2	COVID 19
SARS-COV-2 stands for "severe acute respiratory syndrome coronavirus 2"	COVID-19 stands for "coronavirus disease 2019."
Severe acute respiratory syndrome coronavirus 2, shortened to SARS-CoV-2, is actually the virus that causes COVID-19 (the disease).	The acronym COVID-19, 'CO' stands for 'corona,' 'VI' for 'virus,' 'D' for disease and 19 indicates the year it was discovered.
"Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) was chosen because the virus is genetically related to the coronavirus responsible for the SARS outbreak of 2003.	WHO announced "COVID-19" as the name of this new disease on 11 February 2020, this was done in order to allow discussion on disease prevention, spread, transmissibility, severity and treatment.
A person can be infected by SARS-CoV-2 and not have COVID-19 if they are not feeling sick or have only very mild symptoms.	

The next table present the principal differences between SARS-coV2 and COVID 19.

As for the COVID-19 disease and why it affects children less, three hypotheses are handled:

- **The first** one is the presence of ACE2 receptors in less quantity in children's lungs; this in comparison with the adult population, because to carry out the replication and later infection, it is necessary the interaction of the ACE2 receptor with the SARS-CoV2, and if the receptor is in low quantities the possibility of infection with the virus will be less.
- **The second** is the theory of endothelial damage, since prior endothelial damage may facilitate and increase an inflammatory response to SARS-CoV2, however, in healthy children prior endothelial damage is absent. This endothelial damage is caused by clinical conditions ranging from congestive heart and kidney failure, hormonal disturbances, drug use, and diabetes mellitus, as well as physical factors such as exposure to tobacco smoke in the adult and young adult population.
- **The third** is innate immunity, that is, the first line of defense against SARS-CoV2, which is stimulated in children by the acquisition of viral infections common in this population group, as well as by the vaccination schedule. This type of immunity is more active in children, and this not only contributes to the defense of viruses, but also of microorganisms such as bacteria, in the case of the latter which are sometimes responsible for producing diseases at the respiratory level in children, and in greater incidence in those who live in climatic conditions that favor the suffering of diseases at the level of the respiratory system [15].

Immune System in Children with SARS-CoV2

The human immune system is developed to generate protection against pathogens or foreign agents that can cause damage, and the first line of defense is the mechanisms of non-specific and specific immunity, which include physical barriers, such as skin, mucous membrane, mucus layer, ciliated epithelial cells, NK lymphocytes (Natural Killer), *i.e.* natural killer lymphocytes, dendritic and phagocytic cells. On the other hand, there is the complement system, as well as the different components of the specific immune system, represented by T and B lymphocytes, the latter being the only cells that have the ability to recognize specific antigens [24, 25].

The spread of SARS-CoV2 in this population group has been largely through direct contact with family members and other children with COVID-19 disease, which highlights the rapid and easy spread of the virus from person to person, or through contact with contaminated surfaces that serve as fomites for the spread of the disease, and is also related to risk factors such as certain underlying diseases that compromise the host's immune system [26-28]. On the other hand, it is necessary to take into account the relationship of the (ACE2) which is the cellular receptor of SARS-CoV2, something that is not yet clear, is the capacity of binding of the virus and sensitivity of the ACE2 receptor in children, however, some authors describe that this binding may become less in this population group, due to the functional and response capacity of the immune system that they handle without conditions and relatively healthy, Within this, certain environmental factors can have effects on the immune system such as bacteria, exposure to the sun, age, exercise, stress, and exposure to industrial smoke and cigarette smoke, which generates that in this population group the first line of defense or innate immune response has a more

active functional capacity in those children who do not have comorbidities such as diseases of the immune or respiratory system [29, 30]. Moreover, the presence of children in environments such as schools or colleges is a continuous factor of production of antibodies against pathogens and also these antibodies are variable and sufficient to act as protection to fight the COVID-19 [31-33].

Another factor that some authors have based on is that children experience respiratory infections, especially in countries with changing seasons, in winters may have higher levels of antibodies against the virus, and competition between viruses that colonize the respiratory mucosa in this population represents that the SARS-CoV2 virus has a lower capacity to adhere to receptors in the respiratory system, in addition the respiratory system of children as it is developing can respond to pathogens more effectively [34, 35].

Immune System in Early Childhood (0-5 years)

In the first months of life of the children the antibodies that are in the woman's organism, are transferred to the baby by means of the maternal lactation, these protect the child of pathogens that previously the mother had faced, it is then that the prevention against lethal diseases, are the vaccines that help to the protection of microorganism that are new for the children, Therefore, these first infections that children face in the first years of life help them build a pool of memory B and T cells that serve in the face of possible reinfections, and the immune system of children in early childhood is prepared for a timely and effective reaction, a function that may be diminished over the years [36, 37].

Immune System in Childhood (6-11 years)

At this stage of life children undergo a process known as "immune preparation", against any new pathogen that includes the SARS-CoV2 virus, this can be based on three principles which are:

1. **In the first phases of the infection, natural antibodies play a significant role.** Most of the antibodies are IgM type that will be generated independently of having had a previous contact with the antigen or strange microorganism, likewise, they have a wide reactivity and a variable affinity. On the other hand, these IgM type antibodies are able to stop the infection for

a period of time of two (2) weeks, until the antibodies that are high affinity and the memory B cells appear, which will clarify the virus and avoid a reinfection. These natural antibodies are produced by innate memory B cells or IgM which are very abundant during childhood and have the capacity to bind to different pathogens.

2. The second principle comes from the ability of children to rapidly produce natural antibodies that have a wide reactivity that have not yet been chosen or shaped by common environment-related pathogens.
3. The third and last principle is given by the fact that most of the memory B cells are of the type CD27dull, which have a high adaptability to new antigens and that after an antigenic stimulus they will differentiate into plasma cells for the later secretion of specific IgM antibodies. On the other hand, in adults the opposite happens since these B cells type CD27 dull are unable to adapt to new antigens [11, 40].

Diagnosis

The main diagnostic method for the detection of SARS-CoV2, is the real-time polymerase chain reaction (RT-PCR), which has a sensitivity of 80% and a specificity of 99%, and is used for the detection of genes encoding surface glycoprotein (Spike Protein) and internal RNA-dependent polymerase of the virus. In addition, it can detect increased viral load through respiratory tract secretion and the use of nasopharyngeal swab sampling [18, 41].

Serological Testing

Also known as rapid tests, it allows the detection of antigen and antibodies. In addition, there are tests developed as "point-of-care-test", which specifically detect IgM and IgG type antibodies. In the course of COVID-19 disease, IgM-type antibodies are developed between 5 and 7 days after the first contact with the virus, while IgG-type antibodies are developed between 15 and 21 days. Therefore, for the diagnosis of COVID-19 it is recommended to perform rapid tests for the detection of IgM/IgG-type antibodies against SARS-CoV2. If positive, the rapid test is considered a confirmed case, but if negative, a second test is recommended for mild cases within one week of the first test [35, 42, 43].

The polymerase chain reaction test with reverse transcriptase (RT-PCR), if the result is positive is considered as a confirmed case and if the result is negative and the clinical evolution of the patient is unfavorable, it is recommended to perform a second test. The interpretation of the results is described in Table 1 [35].

Due to the different clinical manifestations that children can present, it is essential to carry out screening tests of COVID-19 in nursing patients when they are in hospital, since most cases have been presented that this population group presents febrile symptoms. Likewise, due to environmental factors and to the competition of respiratory germs, it is necessary to carry out a differential diagnosis, taking into account that it has been reported the coinfection of COVID-19 with other common respiratory viruses [44, 45] (Table 2).

In children under 18 years of age, it is considered a confirmed case for COVID-19, by means of laboratory confirmation of infection by the SARS-CoV2 virus by

means of RT-PCR or other molecular or genomic tests that are available in our country, this regardless of the clinical signs and symptoms that the person, in this case the child, presents [11, 47].

Treatment

In the therapeutic management some authors recommend antiviral therapy, however, in children there is no specific antiviral treatment for COVID-19, as well as its effectiveness; in most cases of COVID-19 the treatment is for symptomatic patients, where the main treatment route is oxygen therapy in patients with severe infection, as well as the use of mechanical ventilation in cases of respiratory failure, and the use of hemodynamic support is essential to control septic shock. On the other hand, no clinical trials of medications specifically for children have been identified [43, 44, 48].

Nonetheless, there are other therapeutic approaches used as they are:

Table 2: Interpretation of Rapid Test Results (IgM/IgM) and RT-PCR for COVID-19

Result			Interpretation
RT-PCR	IgM	IgM	
Negative	Negative	Negative	Negative / false negative RT-PCR in early stage.
Positive	Negative	Negative	Initial stage of infection / window period.
Positive	Positive	Negative	Early stage / acute infection.
Positive	Positive	Positive	Active infection (transition vs. reinfection)
Positive	Negative	Positive	Late stage of infection.
Negative	Positive	Negative	Early stage / false positive serological / false negative RT-PCR.
Negative	Negative	Positive	Past infection / false negative RT-PCR.
Negative	Positive	Positive	Evolving disease / false negative RT-PCR.

Taken from: Percy J. Sánchez-Tauma, Noé Atamari-Anahui, Carlos Valera-Moreno. Coronavirus disease 2019, COVID-19: Aspects to be considered in children. Review article]. 88 Rev. Medical Body HNAAA 13(1) 2020.

Table 3: Differential diagnosis of COVID-19. [35,46]

Causes	Aetiological Agent
Viral infections	Influenza A and B, Respiratory Syncytial Virus, Parainfluenza, Adenovirus, Rhinovirus, Metapneumovirus, etc.
Bacterial infections	<i>Mycoplasma pneumoniae</i> , <i>Chlamydia pneumoniae</i> and <i>Pneumococcus</i>
Non-infectious causes	Pulmonary manifestations of systemic diseases

Taken from: Pizarro Maria Ester. SARS-COV-2 CLINIC AND DIAGNOSIS. CLINIC AND DIAGNOSIS SARS-COV-2. Department of Cardiology and Pediatric Respiratory Diseases, Division of Pediatrics, Pontificia Universidad Católica De Chile. Neumol Pediatry 2020; 15 (2): 324 - 329.

Table 4: Therapeutic Management of COVID-19

Treatment	Utility
Anti-inflammatories	Therapeutic management has been suggested with the use of ibuprofen, which increases the levels of ACE2 expressed in the epithelial cells of organs such as the lung, intestine, kidney and blood vessels, and through this mechanism, ibuprofen promotes the binding of SARS-Cov2 in its target cells. However, there is not enough evidence to stop the use of this medication in the treatment of symptoms such as fever or pain in this group of patients.
Supportive	According to research by Sun D <i>et al.</i> , the management of critically ill children focused on symptomatic and respiratory support with high-flow oxygen and mechanical ventilation.
Anti-viral	In therapeutic management through the use of antivirals such as ribavirin, oseltamivir, and interferon, in the treatment of critical patients, but not including studies of this type of therapy in children.
Antibiotics	Therapeutic management with antibiotics should be carried out when there is a suspicion of bacterial superinfection, and in cases where sepsis is present it should be treated according to international guidelines for its management.
Corticosteroids	Therapeutic management with steroids in adult patients where this medication was used was not associated with time of virus elimination, hospital stay or duration of symptoms; however, this type of therapy has not been identified in children.
Immune plasma	Therapeutic management with immune or convalescent plasma is that which is extracted after the course of the disease and the development of antibodies against the virus in patients who have had COVID-19. Passive administration of antibodies through transfusion of convalescent plasma can be a strategy as post-exposure prophylaxis or treatment of patients. Convalescent plasma has a short-term effect that does not exclude the risks associated with transfusion. Its efficacy in treating other viruses has been reported; however, clinical trials are still underway to evaluate its efficacy in COVID-19.

Taken from: Llaque Patricia. Infection by the new coronavirus 2019 in children. Review article. National Institute of Child Health San Borja, Lima, Peru. Peruvian University of Applied Sciences, Lima, Peru. Peruvian Journal of Experimental Medicine and Public Health. vol.37 no.2 Lima April.

The review found no clinical trials on the therapeutic management of the disease in children and no vaccine is currently available.

CONCLUSIONS

According to the review of literature and data available to date, children are a population that has a high susceptibility to be infected with SARS-Cov2, although in this population group is present with less incidence and a better prognosis of the disease cure compared to the population under 18 years, evidenced in figures such as 90% of cases in the pediatric population are mild and their recovery is between 1-2 weeks after the onset of the disease, likewise the number of severe cases and deaths is low.

In terms of disease transmission, children are a population group that plays a crucial role in viral transmission in the community because the elimination of the virus by secretion is prolonged and therefore it is important to consider measures of social isolation, not only from this specific population group, but also from the general population.

Although the capacity of infection of children with the SARS-CoV2 virus is very high; due to the

functionality of the immune system at this stage of life, specifically of innate immunity, the presentation and course of the disease is less serious, although it is still not very clear what the mechanism of this virus in children is, compared to the pathogenicity of the virus in this population group. Without a doubt, the immune system is a natural barrier that minimizes the suffering of pathologies at respiratory level, the role of this system goes from natural barriers, that is, innate immunity to the production of certain proteins such as interleukins (IL), which help the regulation and response of this system, however, a deficient function of this system is not only from the pathological level, but also sometimes the human being contributes to its deficient functioning as it is the exposure to environmental factors.

While the mechanism of SARS-CoV2 infection is not yet clear in children, one thing that can be clear is that children are at the same risk of developing COVID-19 as adults; Likewise, among the factors related to the different response capacity of adults to this disease, is the expression of ACE2, physical barriers with greater functionality in children, the pull of immune cells in greater quantities, as well as a more effective response capacity, another important factor is the production of

antibodies that are produced after vaccination and that all these factors together help fight the infection by pathogenic microorganisms.

IMPLICATIONS OF RESEARCH

This review contribution the families, daycare centers, and elementary schools, knowledge through the literature compilation presented about the mechanism that virus responsible of disease COVID 19 in the immunologic system of the children and this form can to take strategies preventive and the control in the transmission of the virus SARS-CoV2; also to the future researches the information presented will be useful for contextualize about the structure viral particle, the physiopathology, diagnosis and treatment in child population with factors of risk to suffer COVID 19 for SARS - CoV2.

The COVID-19 disease does not distinguish from race or ethnicity, but, the increase in cases of this disease in a specific population is given due to inequities or inequalities in terms of health systems, triggering a massive contagion; another important point is the diversity of cultures in the world, leading to inadequate management of this disease easy and spread quickly; of other part, be carrier to the SARS-CoV2 virus does not distinguish from race or ethnicity, as it is not simply a matter of color, but is related to the responsiveness of the immune system and respiratory system, being a respiratory-type condition virus, as well as its susceptibility, since SARS-CoV2 virus can not only lead to mild symptomatic disease such as coughing, fever or general discomfort, but in some cases can lead to complications that lead to death.

ABBREVIATIONS

COPD: Chronic lung disease

ACE: Receptor of the angiotensin converting enzyme

NK: Lymphocytes Natural Killer

RT-PCR: Polymerase chain reaction test with reverse transcriptase

IL: Interleukins

AUTHORS' CONTRIBUTIONS

RINS wrote the manuscript and revised the literature; MAM and DPLV revised the manuscript and approved the final version of the manuscript.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no conflict of interests.

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