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REVIEW ARTICLE

Clinical and Statistical Evaluation of the Effects of COVID-19 in Pediatric Patients

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ABSTRACT

Introduction: COVID-19, also known as coronavirus. The SARS-CoV-2 virus spreads rapidly from one individual to another, mainly through coughing, sneezing, or close contact.
Objective: to analyze COVID-19 infection in children, highlighting clinical differences compared to adults.
Methodology: this study reviews scientific literature from the last five years in databases such as Scielo, Elsevier, and Pubmed.
Development: there is a higher prevalence of asymptomatic or mild cases in the pediatric population. An analysis of 72,314 reports indicated that infections occurred in children and adolescents. At the Children's Hospital of Wuhan, among 1,391 exposed children, there was a male predominance with a mean age of 6.7 years who were hospitalized.
Conclusions: multisystem inflammatory syndrome is a serious manifestation in children, potentially affecting multiple organs. Hematological studies have reported lymphopenia and elevations in liver and muscle enzymes. The most common symptoms include fever, cough, tachypnea, and gastrointestinal manifestations, evidencing clinical variability in this population.

Keywords: Children; COVID-19; Lymphopenia; Liver Enzymes.

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INTRODUCTION

COVID-19, also known as coronavirus. The SARS-CoV-2 virus spreads rapidly from one individual to another, mainly through coughing, sneezing, or close contact. Respiratory secretions larger than 5 microns in diameter can travel up to two meters and can spread and propagate diseases if they reach the hands or feet and enter the mouth, nose, or other mucous membranes.[1]

The replication process occurs by the binding of viral proteins to mobility surfaces, ACE2 receptors, and the viral replication process. The virus then enters the cell via endosomal or non-endosomal pathways. After internalization, the capsid and viral RNA are released into the cytoplasm. Next, the necessary enzymes are synthesized by replication and transcription of the virus to produce a copy of negative RNA. These subgenomic RNA copies can be used to generate slow structural proteins.[2]

Pediatric COVID-19 has characteristics different from those in adults, including more identified hospital contacts and a higher number of asymptomatic or mild cases. This can be verified by analyzing 72,314 reports of infection caused by SARS-CoV-2. A study conducted by a Chinese institute dedicated to monitoring and preventing diseases revealed that 1 % of incidents occurred in infants and children. The Centers for Disease Control and Prevention of South Korea, one of the countries that has conducted the most tests on its citizens, reported that as of March 20, 2020, 1,1 % of cases occurred in babies and children under nine years.[3]

Another example comes from the Children's Hospital of Wuhan, the only facility in the city dedicated to treating children affected by COVID-19. We evaluated 1,391 children who had contact with a suspected or confirmed SARS-CoV-2 infection. Additionally, we studied 171 infants hospitalized with COVID-19. Of these children, 60,8 % were male, with a mean age of 6,7 years, spanning from one day to 15 years. Regarding symptoms, 15,8 % of the children were asymptomatic. 19,3 % presented the aforementioned respiratory symptoms. 64,9 % had pneumonia.[2]

However, a severe form of the disease has been reported in children called multisystem inflammatory syndrome related to SARS-CoV-2. Regarding laboratory analysis, a large portion of children tend to have normal levels in leukocytes, lymphocytes, and neutrophils, and elevated acute phase reactants are rare. The most common radiological features include chest X-rays and video images evaluated by computed tomography. But these functions are not very clear.[4]

The differential diagnosis of SARS-CoV-2 in children includes viral infections such as influenza A, respiratory syncytial virus, and adenovirus, which cause fever and respiratory symptoms, as well as other diseases affecting the lungs and their complications, e.g., presence of pulmonary hemangioma, neoplasia, or foreign body. [5]

As for symptoms, fever is common in children, and generally, fever below 39 ℃ lasts at least three days. Cough is the second most common symptom. Other symptoms, such as headaches and neck pain, are less common in children. Tachypnea and abnormal cardiac findings are also common in hospitalized patients. Gastrointestinal symptoms, such as diarrhea, are more common in children than in adults, and vomiting is more prevalent in pediatric patients. This may be related to the binding of SARS-CoV-2 to the angiotensin-converting enzyme 2 (ACE2) receptor in the epithelial cells of the intestine.[4]

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SARS-CoV-2 is a single-stranded RNA virus with a favorable approach, its genetic material based on 30 kb that determines 14 open reading frames (ORF). These ORFs produce four structural proteins: spike protein (S), nucleocapsid (N), envelope (E), and membrane (M), as well as 16 support proteins and 9 accessory proteins. Regarding the S protein, it enters the virus through its surface, giving it a crown-like appearance. This protein will be divided into two parts, S1 and S2, wherein the furin enzyme in cells will produce the virus. The S1 part binds with the ACE2 enzyme, and the S2 part is also the protein of the cell membrane, such that the entry of SARS-CoV-2 into human cells occurs by the combination of the S protein with ACE2, which acts as the receptor.[6]

When an infectious agent enters the cellular unit, its antigen (RNA) is released into the cytosol, where it is replicated, and a new layer of protein with viral particles enters the cell membrane. The virus antigens are displayed on antigen-presenting cells (APC), which play a crucial role in the immune response. The APC then presents antigens to the major histocompatibility complex, known as specific cytotoxic T lymphocytes. This activates cellular and humoral immunity, leading to the production of IgM and IgG antibodies. IgM levels stabilize around the twelfth week, while IgG levels can remain elevated for an extended period.[7]

METHODS

1. Study Design

The development of the work titled "Case Analysis of COVID-19 Infection in Children" is established as a mixed-type research based on the collection of information from cases found in articles presented by various hospitals worldwide since 2020.

2. Population and Sample

Population: Pediatric patients aged from zero to 15 years.
Sample: A total of twenty pediatric cases infected with COVID-19 were included with the intention of performing an individual analysis of medical histories to detect various factors such as: symptoms, related diseases, complications, biochemical markers, and treatments.

3. Inclusion and Exclusion Criteria

Inclusion Criteria:
- Children who presented complications ranging from mild to severe due to COVID-19 infection.
- Pediatric patients with diseases linked to the presence of the infection.
- Children with underlying conditions affecting treatment and disease progression.

Exclusion Criteria:
- Children who did not present symptoms (asymptomatic).

4. Instruments and Data Collection Techniques

Quantitative:
- Exploration of information found in medical histories to obtain data suitable for comparing factors such as symptoms, related pathologies, therapeutic approaches, and biochemical markers.
- Creation of comparative tables based on the presented symptoms.

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Qualitative:
• Analysis of articles in databases such as Scielo, Elsevier, and Pubmed.

Procedure:
1. Selection of the topic based on age range and sex of the patient.
2. Search for clinical cases presenting various factors related to COVID-19 in children.
3. Classification of cases.
4. Analysis and synthesis of the information found.

DEVELOPMENT

The "cytokine behavior" of the viruses demonstrates this, but the cause is general. This affects cell motility and other highly sensitive cells, but it can remain inactive between Covid-19 and other infections. Masik Gyakoli Harlock, a patient with acute respiratory distress syndrome (ARDS). As the mechanism of ARDS changes, pro-inflammatory cytokines (IFN-α, IFN-γ, IL-1b, IL-6, IL-12, IL-18, IL-33, TNF-α, TNF-β) and chemokines (CCL2, CCL3, CCL5, CXCL8, CXCL9, CXCL10) are also involved. The lungs show signs of damage due to the disease, including alveolar effusion and interstitial inflammation. Other findings include fibrotic effusion, alveolar epithelial proliferation with focal desquamation, hyaline membrane formation, and thrombosis of small vessels, along with displacement of bronchial epithelium.[8,9]

There are three theories regarding why children are less likely to be exposed to COVID-19. The first shows that children have fewer ACE2 receptors in their lungs. The second theory, called the endothelial injury theory, states that initial damage to the endothelium may reduce and optimize its response to SARS-CoV-2. However, concerning healthy infants, this type of primary endothelial injury is rare or virtually absent. The third hypothesis suggests that the immune system, the first line of defense against SARS-CoV-2, is stronger in children due to exposure to common infections and vaccination programs.[10]

Biosafety is essential when collecting and processing samples for COVID-19 diagnosis. The WHO recommends a biosafety level of 2 for this test. Laboratory personnel must receive specialized training in pathogen handling and work under the direct supervision of qualified research staff according to individual laboratory guidelines.[11]

Several studies on COVID-19 in children have been conducted. These included hematological, enzymatic, and inflammatory marker analyses. In hematological analyses, it was observed that the white blood cell count varied within a normal range, with some cases of leukocytosis. However, the presence of lymphopenia was significant in a considerable percentage of pediatric patients. Regarding enzymatic studies, variable increases in alanine aminotransferase (ALT) and creatine phosphokinase (CK) levels were found, indicators of liver and muscle damage, respectively.[2]

Many patients also have high concentrations of C-reactive protein (CRP), which is an inflammatory indicator that can sometimes indicate an ongoing bacterial infection. Findings from chest X-rays and computed tomography (CT) scans show that CRP often appears in the form of crystals in children with COVID-19, but routine X-rays show some underlying conditions.[3]

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According to COVID-19, conditions observed in children include: Pediatric multisystem inflammatory syndrome, Kawasaki disease, toxic shock syndrome, bacterial sepsis, and macrophage activation syndromes. Severity is categorized into three levels: Mild illness: characterized by symptoms such as fever, difficulty breathing, or findings on chest X-rays suggesting pneumonia due to SARS-CoV-2. Severe illness: manifested by fever, dyspnea, and radiological symptoms of pneumonia due to SARS-CoV-2, which may require oxygen. Critical illness: includes respiratory failure requiring mechanical ventilation, acute respiratory distress syndrome, shock, respiratory failure, and organ failure. [12]

During laboratory exams conducted on children with SARS-CoV-2, it can be observed that the mean leukocyte count varies in hematological terms, while lymphopenia presents different figures from the normal range. The enzymatic study also shows variability, with an increase in alanine aminotransferase (ALT), although some authors do not report alterations in this parameter. Creatine kinase (CK) shows increases across all studied series, ranging from 20 % to 75 % of examined patients. [2]

The increase in ALT indicates liver damage, while elevated CK levels signal muscular injury, which may include the myocardium, although it is not as characteristic as troponin. In the studies conducted, no symptoms of myocarditis were reported. The simple chest X-ray reveals few abnormal signs in the structures of the respiratory system, but the CT scan frequently shows irregular infiltrates resembling ground-glass opacities, without the presence of pleural effusion, lymphadenopathy, lobar collapse, pneumothorax, or effusion in children with SARS-CoV-2. [4]

Accumulated genomic analysis indicates that COVID-19 utilizes the same human cellular receptor as SARS-CoV, ACE2. This ectoenzyme is bound in various tissue cells to the plasma membrane, particularly including the heart, lower respiratory tract, gastrointestinal tract, and kidneys. SARS-CoV-2 adheres to ACE-2 through its spike protein, allowing the virus to penetrate and infect the cells. This process is completed with the help of a transmembrane serine protease type 2 (TMPRSS2), leading to a reduction in ACE-2 expression on the cell surface. [13]

In the hospital environment, the care of confirmed SARS-CoV-2 patients always integrates epidemiological and clinical criteria for their follow-up. The decision to admit a patient follows a strict protocol and is not arbitrary. In areas of minimal, intensive, or progressive care, the availability of data, such as the geographic location of patients, the condition of their contacts, clinical manifestations by age groups, and medical history, provides the medical team with the necessary information to decide on the best treatment plan or hospital discharge without the risk of active contagion. [14]

The significant increase in new cases, both mild and severe, raises numerous questions for specialists such as intensivists and internists about this new disease. According to specialists, it is sometimes difficult to define a clinical case, as patients may exhibit symptoms similar to other severe respiratory infections.

Furthermore, the case definition proposed by WHO seems to be based on specific polymerase chain reaction (PCR) testing. [15]

SARS-CoV cases in children have been fewer than in adults. Epidemiological studies show that children account for around 1-5 % of confirmed COVID-19 cases globally. Prevalence varies by region, community transmission rates, diagnostic testing policies, and epidemiological surveillance. [16]

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The virus spreads through respiratory droplets emitted when people sneeze, speak, or cough, entering the respiratory system by inhaling these infected droplets, aerosols, or direct contact with contaminated surfaces and objects. Initially, it was thought that children were less likely to contract the disease, but subsequent epidemiological data revealed that family cohabitation and transmission mechanisms increased contagion among children and adolescents. Asymptomatic carriers are the main source of infection. Additionally, it has been reported that SARS-CoV-2 can also be transmitted via fecal-oral route. However, transmission through breast milk or from mother to child is still unclear. [13]

There are several immunological theories attempting to explain why children experience fewer complications. One of the most prominent refers to the ACE2 receptor, which is the binding point for COVID-19. It is suggested that children have a lower amount of ACE2 receptors and therefore a lower affinity compared to adults, which might make them less susceptible. Another theory proposes that children are less affected because mortality is associated with comorbidity. Since children have fewer concomitant illnesses, they are expected to show a lower morbidity and mortality rate. However, in Mexico, there is a high prevalence of childhood obesity, leading to a significant number of children with diabetes, cardiovascular risk, and chronic kidney disease, which could increase mortality. [15]

The Coronavirinae subfamily, part of the Coronaviridae family, includes four genera of COVID-19: Beta, Alpha, Gammacoronavirus, and Delta. Genomic sequencing analyses have shown that SARS-CoV-2 belongs to the Betacoronavirus genus. This virus is a positive-sense single-stranded RNA virus and is enveloped.[13]

Although children can contract and transmit SARS-CoV-2, evidence suggests they are less likely to be "superspreaders" compared to adults. However, outbreaks in school and community settings underscore the need for effective preventive measures.[14]

The mortality rate from COVID-19 in children is extremely low compared to adults. Studies show that most infected children present mild symptoms or are asymptomatic. However, in rare cases, some children may develop severe complications such as Multisystem Inflammatory Syndrome in Children (MIS-C), which can be potentially fatal if not treated adequately. The life expectancy in children affected by COVID-19 has not significantly altered due to the low mortality rate and rapid recovery in most cases. Nonetheless, severe complications and comorbidities can affect prognosis and quality of life.[16]

The risk of contracting the SARS-CoV-2 virus is higher in children with Type 1 Diabetes Mellitus. Diabetic children infected with COVID-19 have a higher probability of developing severe symptoms and complications. Pediatric patients with Type 1 Diabetes Mellitus are at greater risk of progressing to critical and severe forms of the disease, making it crucial for them to maintain rigorous glycemic control to prevent complications. [17]

Children and those under one year predominated. Family transmission was the most common, pre-existing conditions were identified, and deaths were less frequent compared to adults. The main clinical symptoms included cough, fever, nausea, sore throat, vomiting, difficulty breathing, diarrhea, and abdominal pain. Treatment consisted of isolation, and both symptomatic and experimental treatments were employed.[18]

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The mortality of COVID-19 is higher than that of recent seasonal influenza due to its high infectivity and the large number of affected individuals. COVID-19 replicates efficiently in the upper respiratory tract and exhibits distinct epidemiological characteristics from conventional human coronaviruses that cause many common colds in winter. COVID-19 symptoms develop more slowly, resulting in a longer incubation period. During this time, infected individuals remain asymptomatic and continue their usual activities, facilitating the spread of the virus.[19]

Several studies indicate that the pediatric population affected by a COVID-19 infection is vulnerable due to predisposing factors. Some of these factors include pathologies such as immunodeficiency (weakness of the immune system that allows the progression of an infection), Down syndrome, hypertension, and diabetes mellitus, thus these patients should be monitored as a preventive measure against severe or critical states.[20,21]

Conversely, there are certain alterations in chemical indicators in children that may conclude in the presence of a pathology due to COVID-19; for example, in the case of Transient Multisystemic Inflammatory Syndrome, the markers we find affected are those related to inflammatory conditions: fibrinogen, C-reactive protein, or elevated D-dimer, which also presents with positive and negative COVID tests. The pathology must be closely monitored because it generates problems affecting certain critically important organs like the heart, considering that the symptomatology is generalized inflammation that usually begins with pain in the abdominal area at a high or intense level. A controlled solution to this pathology is the use of gamma globulin and steroids, whose long-term consequences have not yet been evidenced.[22]

Similar to multisystem inflammatory syndrome, Kawasaki disease appears alongside COVID-19 in infected individuals older than five years. This condition can lead to myocarditis and receives fewer immunoglobulins as treatment compared to the same syndrome but without respiratory pathology. Altered biochemical markers are observed, such as leukopenia, increased ferritin, and markers indicating myocardial damage, in addition to harming the patient's neurological status.[21]

Additionally, another pathology associated with COVID-19 infection is myocarditis, inflammation of the myocardium that impairs the heart's proper contraction. It was demonstrated that a pediatric patient around 13 years old was evaluated by the University Assistance Complex of León, showing an alteration in C-reactive protein due to elevated levels as well as troponin I aggregates, diagnosed as myocarditis, which was quickly identified thanks to imaging techniques known as MRI for patients with heart diseases.[22]

There are also conditions related to the infection caused by COVID-19, such as disorders linked to taste. For diagnosing these disorders, solutions prepared with sucrose or caffeine are used, and a medical history is taken to determine whether the patient has the alteration or not. In pediatric patients, an association was found with disorders such as anosmia, leading to the conclusion that several senses are affected, which are uncommon symptoms produced by the COVID-19 infection.[23]

Regarding pneumonia, it primarily occurs in pediatric patients under five years old, mainly caused by Streptococcus pneumoniae and associated as an etiological factor with COVID-19. Additionally, biochemical tests demonstrate elevated markers such as interleukin-6 and an increase in C-reactive protein. It was also determined that this infectious pathology causes interstitial pneumonia, which tends to lead to scarring in lung tissue.[24,25]

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Children with COVID-19 are more likely to benefit from healthy eating habits. Supporting a balanced diet and preventing deficiencies in vitamins and minerals is crucial. In hospitalized children, nutritional status before ICU admission and prognosis influence the need for ventilatory support concerning morbidity and long-term mortality.[26]

Studies have shown that supplements containing retinol, B complex vitamins, ascorbic acid, calciferol, tocopherol, iron, zinc, selenium, and omega-3 are beneficial for patients with COVID-19.[27]

A study conducted by Valla and his team found that children with severe diseases had significantly lower levels of selenium, copper, zinc, vitamin C, vitamin E, and beta-carotene, as well as higher oxidative stress. Thus, supplementation may be necessary.[28]

The transmission of COVID-19 in children, after analyzing 20 clinical cases where data such as symptoms, elevated or decreased biochemical markers, diseases developed due to the infection, and underlying conditions in patients were described, showed that the disease actually has a low rate regarding pediatric patients. However, it was also confirmed that the presence of a pre-existing disease in the patient developed risky characteristics and potentially fatal pathologies.

On the other hand, we conclude that COVID-19 is an infection with a high degree of contagiousness and is viral in nature, as it originates from the association of the virus with the plasma membrane of the patient's cells. This pathology has a great variability in its symptoms and pharmacological treatment, and that history of various prior disorders in the patient, such as diabetes, asthma, obesity, or heart diseases, can affect the worsening of the individual. Only if it occurs in pediatric patients, due to a better immune response compared to adults, this age group is not exposed to significant risk and presents a low contagion rate.

Furthermore, one of the main pathologies to consider in the clinical setting for the patient is multisystem inflammatory syndrome in children, which according to author Márquez M et al.,[16] in their article "Clinical spectrum of COVID-19, disease in pediatric patients," indicates that this condition tends to start in the abdominal area with high-level pain that can become intense, subsequently affecting other vital organs, structures, and tissues that are compromised, such as those forming part of the digestive system, arteries, veins, and the eyes.

Within this framework, diverse symptoms are observed for the pathology; however, specific common characteristics in children include a temperature lower than 39 °C lasting between one and at most three days, diarrhea as the primary gastrointestinal symptom, and finally, the presence of vomiting. Similarly, less frequent but pronounced symptoms in the pediatric population include tachypnea, headache, and sore throat.

Indeed, according to results obtained through statistical tables, it was evident that in male cases the most frequent symptom is fever at 66,67 % compared to female cases where cough is the most frequently occurring symptom at 62,5 %. Additionally, it's important to highlight that vomiting is the least frequently present symptom in both sexes, being 37.

It should be noted that following the analysis according to sex, Table 1 shows that among the principal symptoms for pediatric males, fever reaches a higher percentage compared to cough and vomiting, as this is a normal body response to the presence of an infection, exhibited more in comparison to females, with 66,67 % in males and 50 % in females, marking a 16,67 % difference.

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The symptom that stands out the most is cough because this infection is respiratory in nature; thus, upon making a comparison, it is noteworthy to recognize that in male patients it appears in only half of the cases, while in females it has a higher value at 62,5 %.

While vomiting is an important symptom due to its association with the digestive system, which is one of the areas affected by COVID-19 infection, it is emphasized that in both males and females this symptom is the least frequent due to values like 25 % in men and 37,5 % in women, primarily linked to the children's immune system, which is competent at preventing the virus from reaching the cells in this area.

In the age range analysis, we highlight two main groups: those pediatric patients who are months old and those who are already years old since their birth. The former show more pronounced symptoms regarding fever and cough, while from one year to five years, there is a 100 % presence of fever, and lastly, from six years onward, the most frequent symptoms are cough and vomiting.

When comparing infants of months, it is observed that both the ranges of zero to six months and seven to twelve months present an equality of 75 % in fever, but their most notable difference lies in the cough, where the first group shows 50 % and the second 100 %, and in vomiting, with a lower and almost imperceptible range of 25 % and 0 %, respectively.

In this sense, cases from one year of age are similarly addressed, finding fever as a primary symptom because in two age ranges it repeats with an incidence of 100 %, followed by vomiting at 66,67 % and cough at 50 %, the last two symptoms mentioned appear more prominently from six years of age onward.

Finally, it is pertinent to note that the symptoms presented by the pediatric patient will be important for their evolution; moreover, according to what has been demonstrated through case analysis and presented tables, these vary according to sex and age, which significantly influences providing adequate treatment and avoiding pathologies that arise from the presence of COVID-19.

According to the World Health Organization, the data confirms the statement regarding the presence of milder symptoms in pediatrics, evidenced by the statistical table showing no markers at 90 to 100 %. The most common symptoms in children under five years old are fever and cough, which aligns with the values obtained of 75 % and 100 %. Meanwhile, in pediatric patients over five years old, symptoms begin to reference the gastrointestinal system, which concurs with obtaining the highest percentage among other symptoms at 66,67 %.

The findings of this research show that compared to adults, children with COVID-19 tend to exhibit lesser clinical severity and have a reduced frequency of severe complications.[10] This discovery aligns with previous research indicating that the immune system response in pediatrics may differ from that observed in adults, possibly due to stronger innate immunity or variations in the expression of viral receptors. Nonetheless, the literature indicates that certain children may develop severe complications, such as multisystem inflammatory syndrome (MIS-C), emphasizing the need for continuous monitoring.[1,7]

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In relation to the cardiac complications observed, our research confirms that SARS-CoV-2 infection in pediatrics can lead to myocarditis and other cardiac alterations. This finding aligns with current literature that has recorded cases of myocarditis and other cardiac issues in children affected by SARS-CoV-2. According to Caballeros, cardiac magnetic resonance imaging has proven to be a valuable tool for identifying and assessing myocardial damage, which coincides with its demonstrated utility in evaluating these complications.[4,6]

Cardiac complications in children, although less common than respiratory issues in adults, represent a critical area that requires special monitoring. Early identification of myocarditis can prevent progression to more severe forms and improve long-term outcomes. Additionally, attention to these complications should be personalized, considering each patient's specific clinical characteristics.[27]

Research also highlights the importance of nutritional interventions in managing pediatric patients with COVID-19. The results indicate that appropriate nutritional intervention can positively influence recovery and reduce complications. The recommendations of the Colombian Association of Clinical Nutrition, which promote a balanced diet tailored to the specific needs of hospitalized patients, are consistent with this. Adequate nutrition can help improve the overall patient condition, optimize the immune system, and support recovery after infection.[2]

Our research underscores the need to adapt nutritional recommendations specifically for the pediatric population, unlike the well-documented strategies for adults. The diet in pediatrics must consider both the growth and development needs of children and the dietary restrictions arising from disease. Personalizing this approach has the potential to significantly improve clinical outcomes and the quality of life of patients.[20]

We confirm, by comparing our findings with previous studies, that respiratory and systemic symptoms in children with COVID-19 are generally less severe than in adults. However, the emergence of complications such as MIS-C and myocarditis highlights the need for adapted management strategies and continuous monitoring. The difference in clinical presentation between children and adults emphasizes the need for a specialized approach in the prevention and management of COVID-19.[5,17]

The statistical analysis carried out in this study has helped us confirm international epidemiological data on COVID-19 in children, even though our sample is not representative of the entire pediatric population. Our results are consistent with trends observed globally, where the most common symptoms include fever, gastrointestinal problems, and skin manifestations.[1,3,7,15] It is important to note that although our sample is limited, the data obtained provide a valuable basis for future research. These data can be used to identify the main symptoms and clinical manifestations in children affected by COVID-19, which is crucial for improving early diagnosis and treatment in this age group.

CONCLUSIONS

Through this research, previous data from the WHO and PAHO about the clinical manifestations of COVID-19 in children are confirmed. Although the sample does not represent the whole population, the analysis provides information about the distribution of symptoms by age and sex. COVID-19 in pediatrics can present from absent symptoms to severe conditions like MIS-C. Children generally have a lower risk of severe complications, but certain factors, such as pre-existing diseases, can increase their vulnerability. Continuous research is important to improve

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diagnosis and treatment, as well as long-term follow-up. Early intervention is key to treating children with COVID-19, especially those with MIS-C. The combination of immunoglobulin and steroids helps reduce inflammation. Moreover, differences in immune response between children and adults are relevant, and comorbidities, such as type 1 diabetes and obesity, exacerbate the severity of COVID-19 in children.

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