

COVID-19 COMORBIDITY IN CHILDREN

Andi Giffari Rahmat Budaya¹, Andi Husni Esa Darussalam², Tanty Febrianty Takahasi^{3*}

¹General Practitioner Professional Education Study Program, Faculty of Medicine Indonesian Muslim University, Makassar, Indonesia

²Lecturers of Pediatrics, Faculty of Medicine Indonesian Muslim University, Makassar, Indonesia

³Clinical Educator in Children's Health Sciences Sawerigading Hospital, Palopo, South Sulawesi, Indonesia

e-mail: andigiffarahmat@gmail.com*

*Corresponding Author

Abstract: Covid-19 is caused by SARS-CoV2 or 2019-nCoV, a genus β corona virus. The virus is transmitted by patients through droplets or aerosol particles that enter the airway. Covid-19 was identified in early January 2020 as the cause of the pneumonia epidemic in Wuhan city. This type of research is qualitative. The data collection technique was carried out by literature study. While data analysis was carried out in three stages, namely data reduction, data presentation and conclusion drawing. The results showed that since its emergence, it was found that the infection rate in children is disproportionately lower than adults and children usually have a less severe clinical course. Some risk factors that can increase the transmission of Covid-19 to children are age, gender, comorbidities, and environmental factors. Children with confirmed Covid-19 tend to have comorbidities, the most common of which are congenital heart disease, autoimmunity, tuberculosis, and HIV.

Keywords: Covid-19, Comorbidities, Pediatric

INTRODUCTION

Severe acute respiratory syndrome coronavirus (SARS-CoV)-2, SARS-CoV and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) are a family of novel coronavirus RNA, identified in early January 2020 as the cause of a pneumonia epidemic in the city of Wuhan, then spread rapidly throughout China. After infecting and causing the death of thousands of people in China, the virus has spread, reaching Italy and other European countries and the United States as well as in countries in Asia such as Indonesia (Pascarella et al, 2020).

The first Covid-19 case that spread in Indonesia on March 2, 2020, has confirmed 2 patients from Jakarta. The number of confirmed Covid-19 patients in Indonesia as of June 28, 2023 is around 6,811,945, (Hamjah et al, 2022). Indonesia has found that most Covid-19 cases occur in men (Sukirmana et al, 2022). South Sulawesi Province, which is one of the provinces in Indonesia, is reported to have the highest number of Covid-19 cases outside Java. There are around 104,146 people confirmed positive for Covid-19 in South Sulawesi Province with 94,831 people recovered and 1,979 people died. Furthermore, Makassar City, which is the capital of South Sulawesi Province, is reported to have the highest number of Covid-19 cases among 24 districts/cities (Tiro et al, 2021).

Since its emergence, it has been found that infection rates in children are disproportionately lower than adults and children tend to have a less severe clinical course (Chaiyakulsil et al, 2022). Increased mortality has been seen in older age groups. Covid-19 also affects children. Recent data shows that children are more likely to have milder symptoms. Among children who tested positive, 45% showed typical symptoms, and 42% showed mild respiratory symptoms. While 13% were asymptomatic, no child showed life-threatening symptoms (Hajra et al, 2020).

The study conducted by Cui et al., 2020 obtained a total of 2,597 cases. Covid-19 in children, 198 (7.6%) of which were asymptomatic cases, 1,181 (45.5%) were mild cases, 1,079 (41.5%) were moderate cases, and 113 (4.4%) were severe cases; 23 (0.9%) were critical and the remaining 3 (0.1%)

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died. The study also stated that there was no difference in the number of boys and girls infected (Hakim, 2020).

MATERIALS AND METHODS

This type of research is qualitative research. According to (Sugiyono, 2018) qualitative research methods are research methods based on philosophies used to research on scientific conditions (experiments) where researchers are instruments, data collection techniques and qualitative analysis emphasize more on meaning.

Data Collection Method

The research data collection method uses literature study. Literature study is a technique for collecting data and information through reading literature or written sources such as books, previous research, papers, journals, articles, report results and magazines related to research (Azizah, 2017).

Data Analysis Method

In this study, data analysis techniques were carried out in three stages, namely data reduction, data presentation and conclusion drawing. Regarding these three flows in more detail are as follows (Huberman & Milles, 2002):

1. Data Reduction

Data reduction is defined as the process of selecting, focusing on simplifying, abstracting, and transforming rough data that emerges from written notes in the field.

2. Data Presentation

Miles & Huberman limit a presentation as a set of organized information that gives the possibility of drawing conclusions and taking action. They believe that better presentations are a primary means of valid qualitative analysis, which include: various types of matrices, graphs, networks and charts.

3. Conclusion Drawing

Drawing conclusions according to Miles & Huberman is only part of an activity of a whole configuration. Conclusions are also verified throughout the research. Verification may be as brief as a thought that passes through the analyzer's (researcher's) mind as she writes, a review of field notes, or it may be as thorough and labor-intensive as revisiting and brainstorming among peers to develop intersubjective agreement or as extensive as efforts to place a copy of a finding within another set of data. In short, the meanings that emerge from other data must be tested for truth, robustness, and fit, which is validity.

RESULTS AND DISCUSSION

Pathophysiology

Covid-19 is caused by SARS-CoV2 or 2019-nCoV, a genus β corona virus. The virus is transmitted by patients through droplets or aerosol particles that enter the airway through coughing, singing, nebulizer procedures or intubation. Poor ventilation accelerates transmission. The virus can survive on stainless steel for 5.6 hours and plastic for 6.8 hours. The virus attached to the host cell reflexively binds to the cellular receptor ACE2 (angiotensin-converting enzym 2). The bond formed is ten times stronger than SARS-CoV, then enters the cytoplasm, after coding, the polyprotein is broken down by proteases and chymotrypsin is activated. The resulting complex drives RNA production through replication and transcription, growing into the lumen of the endoplasmic reticulum. Virions are then released from the infected cells through exocytosis. The released virus can infect kidney cells, liver cells, heart, intestine, and T lymphocytes, as well as the lower respiratory tract. Causes the main symptoms and signs of Covid-19. Incubation period 1- 14 days, generally occurs 3-7 days Blood biomarkers show lymphopenia (host defense response from viral invasion), leukocytosis (bacterial

infection), neutropilia (bacterial infection and cytokine storm), thrombocytopenia. Biomarkers of infection are characterized by an increase in CRP, procalsitonin, aminotransperases, LDH, creatinine, cardiac troponin, D-Dimer or Fibrin Degradation Product. Decreased albumin, prolonged prothrombin time, prolonged APTT (activated Partial Thromboplastin) (Sukmana & Yuniarti, 2020).

Recent studies have shown that elevated serum proinflammatory cytokines such as IL1B, IL6, IL12, IFN γ , IP10, and MCP1 are associated with pulmonary inflammation and extensive lung tissue damage in patients with SARS. MERS-CoV infection is reported to induce an increase in the concentration of proinflammatory cytokines such as IFN γ , TNF α , IL15, and IL17. The pathophysiology of the unusual high pathogenicity of SARS-CoV or MERS-CoV is not yet fully understood (PDPI, 2020).

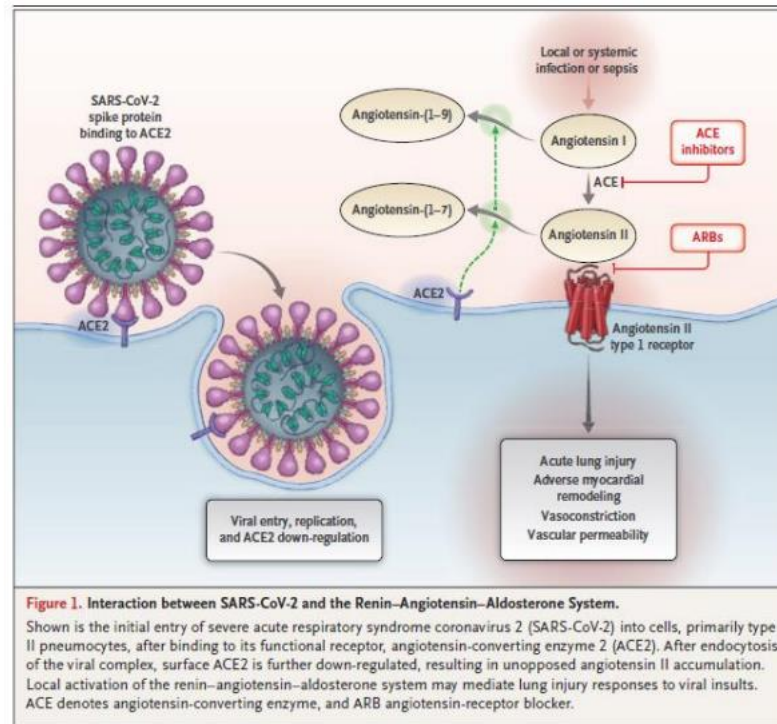


Figure 1. Interaction of SARS-CoV2 with RAA on the surface of the ACE2 receptor

Risk Factors

Some of the risk factors that can increase the transmission of Covid-19 to children are age, gender, comorbidities, and environment. Age is associated with the immunity of children who have not been fully formed when they are young. Gender is associated with hormones possessed by women that can increase their immunity. Comorbidities or comorbidities in children that can increase the risk of being infected with Covid-19 such as genetic disorders, autoimmune disorders, CKD, CHD, Cerebral Palsy, Tuberculosis, Malnutrition, Malignancy, Meningitis, respiratory disorders. In addition, environmental factors can also increase the transmission of COVID-19 to children such as, close contact with parents, playmates, and living in places that report local transmission. Covid-19 cases in Bali were established based on RT-PCR and RDT-Ag. Confirmed patients can experience symptoms or be asymptomatic (Semangiasih et al, 2021).

Based on research at Sanglah General Hospital on children confirmed positive for Covid-19, the comorbidities found were Congenital Heart Disease, Tuberculosis, HIV, Thalassemia, SLE, Meningitis, Asthma and Malignancy. This is in accordance with research in Indonesia in 2020 which states that the comorbidities found are autoimmune diseases, congenital heart disease, tuberculosis, and malignancies. In addition, research in North America and Hubei, China, states that Congenital Heart Disease and Malignancy are comorbidities found (Susilo et al, 2020).

Cancer patients are more susceptible to SARS-CoV-2 infection. This is associated with immunosuppressive reactions, excessive cytokines, suppression of proinflammatory agent induction, and impaired dendritic cell maturation (Susilo et al, 2020). Hence, cancer patients have a high risk of Covid-19 and a poor prognosis (Levani et al, 2021).

Some other risk factors established by the Centers for Disease Control and Prevention (CDC) are close contact, including living in the same house as a Covid-19 patient and a history of travel to infected areas. Being in the same environment but not in close contact (within a 2-meter radius) is considered a low risk (Susilo et al, 2020).

Clinical Manifestations

In general, the symptoms of Covid-19 in children are mild or moderate, rarely severe (Hakim, 2020).¹⁵ The incubation period of Covid-19 in children is in the range of 2-10 days. Approximately 13-15% of children may have no virological manifestations. The most common symptoms during the early phase of infection in children are fever and mild cough. Other clinical features may include sore throat, rhinorrhea, sneezing, myalgia, fatigue, diarrhea and vomiting. Children may have more upper respiratory tract symptoms than lower respiratory tract symptoms and appear to recover within 1-2 weeks. Other findings include pharyngeal congestion, dyspnea or tachypnea, and diarrhea (García-Vera, 2022).

Supportive examination

In supporting the diagnosis and management given to children exposed to COVID-19, it is necessary to conduct supporting examinations, including: Blood; Complete routine blood, ESR, CRP, Procalcitonin. Imaging; Thoracic photograph; Echocardiography upon indication; CT scan of the thorax. Examination to detect SARS-CoV-2 by RT-PCR and sequencing methods; Rapid test examination; Other examinations indicated according to the patient's condition (IDAI, 2020).

Radiologic Examination

Thoracic Xray and CT examinations are not recommended for screening because they often show non-specific results, while lung ultrasound is rarely performed.^{4,6} This examination is recommended in moderate severe pediatric COVID-19 patients, to see the response to therapy, determine the baseline and evaluate progressivity. Based on the COVID-19 Management Guidelines, radiologic features that are suggestive of COVID-19 are (Hadiyanto, 2021):

1. Chest X-Ray: hazy opacities distributed in the basal and peripheral parts of the lungs
2. Thoracic CT scan: bilateral multiple ground glass opacities distributed in the basal and peripheral parts of the lung
3. Lung ultrasound: thickened pleural lines, B lines (multifocal, discrete, or confluent), consolidation pattern with or without air bronchograms.

RT PCR

In children with suspicion of MIS-C, even if the RT PCR result is negative, the diagnosis of MIS-C can still be established considering that clinical manifestations of MIS-C can occur 2-4 weeks after disease onset.¹⁸ The sensitivity of RT PCR depends on the specimen taken, namely BAL 72%, nasal swab 63%, pharyngeal swab 32%, feces 29%, blood 1% and urine 0% (Hadiyanto, 2021).

Laboratory Examination

The features of laboratory examination found in patients with COVID-19 vary. There are cases with leukopenia, leukocytosis, and lymphopenia, but the most common is lymphopenia. Elevated lactate dehydrogenase and ferritin are common and in some cases elevated ami-notransferase is also found. Procalcitonin levels are usually normal, but in individuals admitted to the ICU, levels are found to be elevated (Dewi, 2020).

In children, most cases had normal leukocyte values (70%) while the rest were seen to have either elevated or decreased leukocyte values. About 3% of the infants in the study were found to have

lymphopenia. The few cases of patients with lymphopenia contrasts with the picture of COVID-19 in adults (Dewi, 2020). This could be one of the reasons behind the small number of severe COVID-19 cases in children. Lymphopenia in children does not occur possibly due to the immaturity of the immune system and differences in immune responses compared to adults (Dewi, 2020).

Management

Until now, there has been no definite management for COVID-19 in children, the management given is to adjust to the symptoms, comorbidities and severity suffered by the patient (Hakim, 2022).

Home Treatment

In some cases, patients may have laboratory-confirmed COVID-19, but they have no symptoms. In such patients, home isolation can be discontinued when at least seven days have passed since the date of their first positive COVID-19 test as long as there is no evidence of subsequent illness (Akhtar, 2022).

Hospitalization

Some patients with suspected or confirmed COVID-19 have severe illness that requires hospitalization. Management of such patients consists of ensuring proper infection control, and supportive care. Patients with severe illness often require oxygenation support. High-flow oxygen administration and noninvasive positive pressure ventilation have been used, but the safety of such measures is uncertain, and safety procedures with PPE for aerosol-generating actions should be considered. Some patients may develop acute respiratory distress syndrome and require intubation with mechanical ventilation; extracorporeal membrane oxygenation may be indicated in patients with refractory hypoxia (Dewi, 2021).

Pharmacologically, vitamin c, vitamin D and symptomatic medications can be given based on mild, moderate and severe degrees (PDPI, 2020).

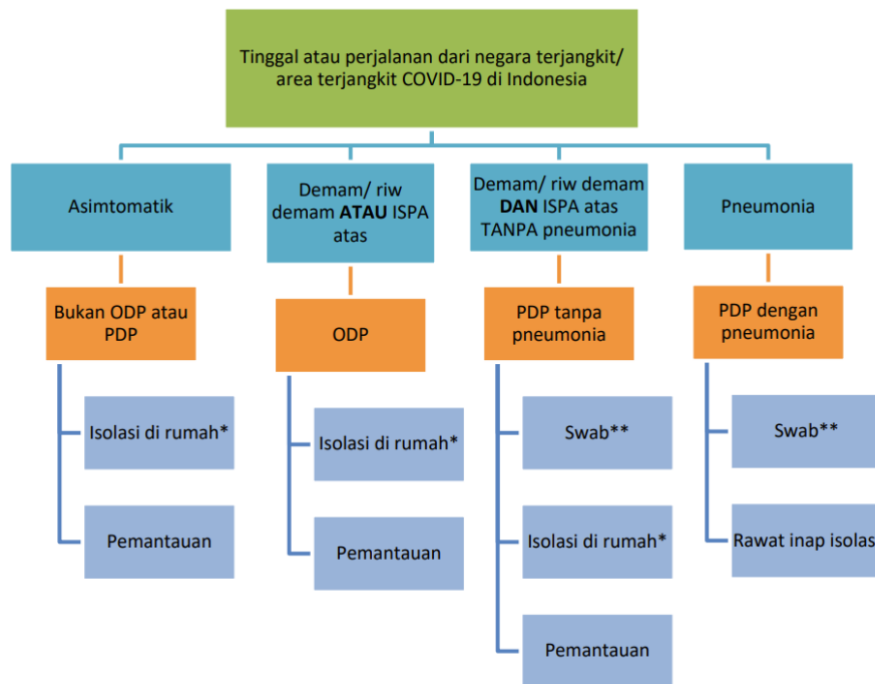


Figure 2. Flow of COVID-19 management by area

Characteristics of the Patient's Condition at Discharge

According to the results of the study, there were still patients with conditions at home who still had to carry out independent isolation as much as 39.5%. This is because within 14 days of treatment, the patient's PCR results still show positive results even though the symptoms have begun to disappear. Positive PCR results may be due to the remaining virus in the body even though it is no longer contagious, to prevent transmission, doctors recommend that patients who go home with

positive PCR results must carry out self-isolation (isoman) as an effort to prevent transmission of the virus. Doctors and nurses will provide education to patients during self-isolation, patients can work at home, use separate rooms from other family members, and always keep their distance from family members, observe the remaining symptoms, if there are still complaints can come to the hospital for a health check. Avoid using the same equipment such as eating and bathing utensils and bedding. Practice healthy and clean living behaviors, and maintain a diet with good nutrition, wash hands and clean the room with disinfectant liquid, and bask in the sun every morning (Khaerunnisa et al, 2022).

CONCLUSION

Since the emergence of Covid-19, it has been observed that the infection rate in children is disproportionately lower than that in adults, and most children have a milder clinical course. However, there are several risk factors that may increase the transmission of Covid-19 in children, including age, gender, comorbidities and environmental factors. Children with confirmed Covid-19 tend to have comorbidities, which are other pre-existing health conditions. Some comorbidities often seen in children with Covid-19 are congenital heart disease, autoimmune conditions, tuberculosis, and HIV. These factors can affect the child's body's response to the virus and lead to more severe symptoms or an increased risk of complications. In addition to comorbidities, other factors that affect Covid-19 transmission in children are age and gender. Younger children tend to have a lower risk of transmission than adolescents or adults. In addition, some studies suggest that males may have a slightly higher risk than females in being exposed to and infected by Covid-19. Environmental factors also play an important role in the transmission of Covid-19 in children. Children who live in areas with high infection rates or have contact with people who are confirmed positive for Covid-19 have a higher risk of contracting the virus. Understanding these risk factors is important to help protect children from Covid-19 transmission and take appropriate preventive measures. Although most children have a milder clinical course, it is still important to remain vigilant against the spread of the virus and protect the health of children and society as a whole.

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