



Research article

Pediatric Covid-19 Patients Characteristics in Dr.Ramelan Central Navy Hospital: A-Year Epidemiology Study

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Abstract

Covid-19 in children has several different characteristics from adults, from clinical manifestation to laboratory results. There are also challenges in Covid-19 diagnosis in children with their inability to describe their condition clearly. Laboratory examination confirmed the diagnosis, but the accuracy was still doubtful. We aim to describe the laboratory examination result of pediatric Covid-19 patients. We analyze the medical records of 69 children with suspected Covid-19 who were hospitalized in isolation room in a year, from May 2020 to April 2021. The suspect patient was examined by PCR test, rapid antibody test, chest x-ray, and complete blood count. Forty patients were Covid-19 positively confirmed by the PCR test. Chest x-ray gave better sensitivity and specificity for early screening than a rapid antibody test. The complete blood count gave normal results in general; only slight relative lymphocytosis occurred. The neutrophilia and lymphopenia patterns in adults with Covid-19 differ from the children's outcomes. The increase of NLR, commonly used as an early screening test for adult Covid-19, cannot be used in children. The lower inflammatory response and physiologically higher lymphocyte cell count in younger age explain these results. In conclusion, the laboratory test should be performed for pediatric Covid-19 cases, but not to confirm the diagnosis.

Keywords: Covid-19, pediatric, laboratory characteristic

Abstrak

Covid-19 pada anak memiliki beberapa karakteristik yang berbeda dengan orang dewasa, mulai dari manifestasi klinis hingga hasil laboratorium. Ada juga tantangan dalam diagnosis Covid-19 pada anak-anak dengan ketidakmampuan mereka untuk menggambarkan kondisinya dengan jelas. Pemeriksaan laboratorium dapat mengkonfirmasi diagnosis, tetapi tingkat akurasi masih diragukan. Kami bertujuan untuk mendeskripsikan hasil pemeriksaan laboratorium pasien Covid-19

anak. Kami menganalisis rekam medis dari 69 anak dengan suspek Covid-19 yang dirawat di ruang isolasi dalam setahun, dari Mei 2020 hingga April 2021. Pasien suspek diperiksa dengan tes PCR, tes antibodi cepat, rontgen dada, dan pemeriksaan darah lengkap. Empat puluh pasien terkonfirmasi positif Covid-19 melalui tes PCR. Rontgen dada memberikan sensitivitas dan spesifisitas yang lebih baik untuk skrining dini daripada tes antibodi cepat. Hitung darah lengkap memberikan hasil normal secara umum; hanya sedikit kejadian limfositosis relatif. Pola neutrofilia dan limfopenia pada orang dewasa dengan Covid-19 berbeda dari hasil anak-anak. Peningkatan NLR yang biasa digunakan sebagai tes skrining awal untuk Covid-19 dewasa, tidak dapat digunakan pada anak-anak. Respon inflamasi yang lebih rendah dan jumlah sel limfosit yang lebih tinggi secara fisiologis pada usia yang lebih muda menjelaskan hasil ini. Kesimpulannya, tes laboratorium harus dilakukan untuk kasus Covid-19 pediatrik, tetapi tidak untuk memastikan diagnosis.

Kata Kunci: Covid-19, anak-anak, pemeriksaan laboratorium

INTRODUCTION

The world is currently impacted by the novel Coronavirus disease (Covid-19) pandemic, which started at the end of 2019 in Wuhan. The spreading novel disease caused by the new strain of Coronavirus, SARS-CoV2. The World Health Organization (WHO) then declared the global pandemic in March 2020, just at the same time as the first cases found in Indonesia. Since then, the disease has rapidly transmitted across the country, and everyone has had a chance of being transmitted. As the fourth most populous country in the world, the case number has been stepping up until more than a year, despite several actions and policies to limit disease transmission (Djalante *et al.*, 2020; Setiati & Azwar, 2020).

Covid-19 is more prevalent in adults, with only 12.5% of confirmed cases in Indonesia found in children below 18 years of age. The severity of the disease in children is also relatively more minor than in adults and the elderly, with a 1.2% mortality proportion in children (Satgas, 2021). However, Covid-19 in pediatrics have some characteristics which give more challenge in diagnosis and tracking, such as the inability to describe their condition and contact clearly status (She *et al.*, 2020). Dominant upper respiratory involvement and more findings of the virus in a fecal sample frequently obtained in a pediatric patient. These characteristics can increase community-based viral transmission, coupled with a high proportion of asymptomatic infection in children (Cruz & Zeichner, 2020).

Covid-19 in children have various clinical manifestation, ranging from asymptomatic to severe respiratory distress. Laboratory results may have a significant role in raising the suspicion of Covid before the standard gold diagnosis of PCR is performed (Du *et al.*, 2020). In this study, we aimed to describe the laboratory characteristics of Covid-19 in children treated in the isolation ward of Dr.Ramelan Central Navy Hospital.

RESEARCH METHODS

1. Patients

This study was a retrospective descriptive clinical study of laboratory characteristics of pediatric Covid-19 patients. The data were collected from medical records of pediatric Covid-19 patients of Dr.Ramelan Central Navy Hospital for a year, from May 2020 to April 2021. The ethical board approved the project of Dr.Ramelan Central Navy Hospital. The patients whose medical records were eligible in this study had been treated in the isolation room due to Covid-19 suspicion, aged between 1 month to 18 years. A suspect Covid-19 diagnosis was made based on clinical manifestation, and the PCR test was performed to confirm the Covid-19 diagnosis.

2. Data collection & analysis

The medical records of the patients were analyzed. The data collected included age, gender, complete blood count test result, radiology findings, rapid Antibody, and PCR test. The radiology findings and rapid antibody results were analyzed to measure the sensitivity and specificity of the test based on PCR results. The complete blood count test from PCR-confirmed positive Covid-19 patients was then analyzed. The Statistical Package performed the data recording and analysis for Social Sciences version 21.0 (SPSS 21.0; SPSS Inc., Chicago, IL, USA). The laboratory findings described measurement data by median (interquartile range) for age and body weight and meant \pm standard deviation.

RESULT

Sixty-nine patients with suspected Covid-19 were admitted to Dr. Ramelan General Navy Hospital from May 2020 to April 2021. All patients underwent blood tests, rapid antibody tests, chest x-ray (CXR), and PCR tests when admitted. Positive PCR-test obtained from 40 patients, which confirmed the Covid-19 diagnosis. The result of rapid Antibody and CXR were various. Thus we analyzed their sensitivity and specificity based on PCR test, as seen in table 1.

Table 1. Sensitivity and Specificity Analysis of the Rapid Antibody Test and CXR

	PCR (+)	PCR (-)	Sensitivity	Specificity
Rapid Antibody (+)	7	7	17.5%	75.86%
Rapid Antibody (-)	33	22		
	PCR (+)	PCR (-)	Sensitivity	Specificity
Thorax (+)	25	9	62.5%	68.97%
Thorax (-)	15	20		

We analyzed the characteristics of the patients whose PCR positively confirmed they have Covid-19. Of 40 children with Covid-19, 24 were male, and 16 were female. The median age and body weight of this study's subjects was 31 (13.25-96) months and 13.3 (10-29.5) kg, respectively

Table 2. Laboratory Findings

Parameter	Mean ± SD
Hemoglobin (g/dL)	12.32 ± 1.98
Hematocrit (%)	36.89 ± 5.57
Thrombocyte (cells/μL)	305725 ± 105954
Leucocyte (cells/μL)	11269 ± 6667
• Eosinophile (%)	0.79 ± 1.82
• Basophile (%)	0.36 ± 0.44
• Neutrophile (%)	58.48 ± 19.73
• Lymphocyte (%)	32.58 ± 17.42

• Monocyte (%)	7.81 ± 3.92
Absolute Lymphocyte Count (cells/ μ L)	3283.96 ± 1858.33
Neutrophil-Lymphocyte Ratio	3.17 ± 3.56

. The laboratory findings included hemoglobin level, hematocrit percentage, thrombocyte, and leucocyte number, and differential count of the leucocyte. We also analyzed the Absolute Lymphocyte Count (ALC) and Neutrophil-Lymphocyte Ratio (NLR), which were significantly different in Covid-19 patients. The analysis can be seen in table 2.

DISCUSSION

Indonesian Health Ministry appointed several hospitals to prepare many isolation rooms in response to the Covid-19 pandemic (Djalante *et al.*, 2020), including Dr. Ramelan Central Navy Hospital. For a year of pandemic response, 69 pediatric patients were admitted due to suspect Covid-19, and 40 patients have it, confirmed by PCR test. The rapid antibody test was continuously performed for the screening of the patients. Since the main complaint of the patients were fever and respiratory symptoms, the CXR was also performed. From our study, the rapid antibody test had low sensitivity but reasonable specificity. This result is in line with a previous study from Bisoffi *et al.*. They reported low sensitivity and high specificity of the Covid-19 serology test. High sensitivity is needed from any screening test when dealing with a suspicious clinical case, especially Covid-19. Thus, rapid antibody tests are not recommended for clinical use. This serology test should be limited to epidemiologic purposes (Bisoffi *et al.*, 2020).

CXR in this study gives more reliable confirmation about Covid-19 with moderate validity of sensitivity and specificity. A previous study in Italy showed 89% of sensitivity and 60% of specificity from CXR results, indicating the role of CXR in Covid-19 diagnosis, mainly when the PCR test can't be performed immediately (Schiaffino *et al.*, 2020). Sensitivity of the CXR Covid-19 detection also increases with time, mainly after six days of disease onset (Stephanie *et al.*, 2020). This

feature can be useful in several indeterminate cases of Covid-19 by performing serial CXR, which more time will give more signs to diagnose Covid-19.

Covid-19 in children have been reported to manifest in milder clinical feature than in adults. However, the exact mechanism of this event is still unknown. Several mechanisms are proposed to describe. For example, children have a lower inflammatory response due to immaturity of the immune system, and external factors in adults aggravate the inflammation process (e.g., smoking, comorbidity) (Du *et al.*, 2020; Ma *et al.*, 2021; Wu *et al.*, 2020). The inflammatory response closely related to leucocytes can be quickly evaluated through standard laboratory examination. In our study, the leucocyte counts slightly above the normal range show no significant inflammatory response changes in children with Covid-19. The other blood parameter also showed a normal level, describing the effect of Covid-19 on the hematopoietic process as minimal.

The neutrophil and lymphocyte are two main subsets of the leucocyte that were mainly reported to have significantly changed in Covid-19. However, there is a difference in the Covid-19 effect on children and adults. In adults with Covid-19, the severity of the disease associated with neutrophil increase and lymphocytes decrease, similar to other viral infections. This feature is then analyzed to increase NLR, which is helpful in the early screening of adult Covid-19 patients in acute critical cases. However, the contrary pattern occurred in pediatric Covid-19. Relative neutropenia and lymphocytosis are common, and the NLR is low (Ish *et al.*, 2020; Wu *et al.*, 2020). The meta-analysis from Ma *et al.* (2020) showed lymphocytosis and lymphopenia could occur in pediatric Covid-19 (Ma *et al.*, 2021). In our study, there is a relative lymphocytosis with low NLR, similar to the previous report. However, lymphocytosis also can be associated with age, as younger children tend to have higher lymphocytes. Children below three years of age had a normal lymphocyte range of 2100-5700 cells/ μ L (Zheng *et al.*, 2020); thus, our study results can be classified in the normal range.

Our study has several limitations. First, the comorbidity of the subject, which can affect the laboratory results, was not analyzed. Second, our study was limited in our hospital, which narrows the patient's source and less number of subjects included. Third, we did not analyze the inflammatory mediator to describe the immune response in children with Covid-19.

CONCLUSION

Chest x-ray examination benefitted the early screening and monitoring of Covid-19 compared to rapid antibody tests. The blood examination showed a different pattern in pediatric Covid-19 than in adults. However, the blood test should not be used to confirm the diagnosis of Covid-19 in children as none of the parameters shows significant results, specifically suggesting Covid-19 in children.

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