

Detection of Anti-Severe Acute Respiratory Syndrome Coronavirus 2 (Sars-Cov-2) Antibody IgM and IgG in Adolescents in Gorontalo

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ABSTRACT

Background : COVID-19 is the disease that caused by SARS-CoV-2 infection. Due to the increasing spread of COVID-19 infection in various countries, WHO declared the infection of COVID-19 as a pandemic situation. Detection of IgM and IgG antibodies using the principle of immunochromatography is considered easier to perform than other test. This method can be used as an initial prediction of SARS-CoV-2 infection.

Aim : The aims to detect IgM and IgG antibodies anti SARS-CoV-2 in North Sulawesi office workers.

Method : This is an descriptive study with cross sectional design. Antibody detection was carried out by dropping the serum of Balai Wilayah Sungai Sulawesi I workers on the examination tool and interpreted according to the result shown.

Result : The test carried out 112 workers showed two workers gave reactive IgM and IgG reactive results, and four workers gave IgG reactive results.

Conclusion : IgM and IgG were detected in Balai Wilayah Sungai Sulawesi I workers and this results could be use as a markers for further examination.

Keywords : COVID-19, SARS-CoV-2, IgM, IgG, immunochromatography

1. Background

Coronavirus Disease 2019 (COVID-19) is a disease caused by a new type of virus from the Coronaviridae family, namely Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). COVID-19 was first identified in China in December 2019 as a respiratory system disease with symptoms of pneumonia of unknown cause.^{(1),(2)} Symptoms that arise due to infection with SARS-CoV-2 can manifest mild, moderate, severe, and even asymptomatic. Thus, prevention of transmission by always implementing health protocols is very helpful to reduce the risk of transmission.⁽²⁾

The rapid increase in the spread of the SARS-CoV-2 virus infection occurred in various countries, so that on January 30, 2020 WHO declared the COVID-19 outbreak a Public Health Emergency of World Concern (KKMMD) and on March 11, 2020, COVID-19 was designated a situation. On September 2, 2020, WHO reported that North Sulawesi as one of 34 provinces with confirmed cases of COVID-19 ranked third as a province with a pandemic.^{(3),(4)} As of early September 2020, nearly 27 million cases of COVID-19 occurred worldwide with the death toll reaching 900,000 reported to WHO.⁽⁵⁾

Indonesia itself first reported two confirmed cases of COVID-19 on March 2, 2020.⁽³⁾ On April 10, 2020, all provinces in Indonesia were confirmed to have COVID-19 patients with the number of confirmed cases as many as 3512 people and the number of deaths reaching 306 people.⁽⁶⁾ Ages 45 – 54 years were confirmed to be the age range with the highest number of cases. Meanwhile, those aged 55-64 years are confirmed to have the highest mortality rate for confirmed cases of COVID-

19.⁽²⁾ Confirmed cases of COVID-19 in Indonesia continue to increase. On September 2, 2020, the number of confirmed cases of COVID-19 in Indonesia reached 180,646 cases with a death toll of 7616 cases, making Indonesia ranked 23rd as the country with the highest number of COVID-19 cases.^{(7),(8)} The highest number of deaths due to COVID-19 per 1 million population after DKI Jakarta and South Kalimantan.⁽⁷⁾

Until now, the examination technique for diagnosing SARS-CoV-2 virus infection is only recommended through molecular tests such as Reverse Transcription-Polymerase Chain Reaction (RT-PCR).^{(2),(9)} Other tests such as Rapid Diagnostic Tests.) is also widely known by the public. One of the rapid diagnostic tests that is often used is the Rapid Diagnostic Test based on antibody detection by the immunochromatographic method.^{(2),(10),(11),(12)} The response of immunoglobulin M (IgM) and/or immunoglobulin G (IgG) in The blood will bind to the SARS-CoV-2 virus recombinant antigen on the test kit. The presence of IgM indicates a primary infection, while the presence of IgG indicates a secondary or long-standing infection. However, the results of rapid diagnostic tests cannot be used as a standard for diagnosis and can only be used for surveillance and epidemiological research.^{(11),(12)}

Many studies have described the detection of IgM and IgG antibodies against SARS-CoV-2 in health workers. However, there is no research data regarding the detection of anti-SARS-CoV-2 antibodies in office employees. Thus, this study was made with the intention of detecting anti-SARS-CoV-2 IgM and IgG antibodies in office employees in North Sulawesi using the immunochromatographic method.

2. Methods

The type of research that will be conducted is descriptive research using a cross-sectional research design. The target population of this research is office employees in North Sulawesi Province. The sample of this study was serum from the blood of the employees of the Sulawesi River Region I Office.

3. Results and Discussion

3.1.Result

Detection of anti-SARS-CoV-2 IgM and IgG antibodies against employees of the Sulawesi I River Basin was carried out on 112 employees' blood serum from a total of 456 employees of the Sulawesi I River Basin. The examination could not be carried out on all employees because other employees were not working in Manado. The blood serum of 112 employees of the Sulawesi I River Basin was examined using a Rapid Diagnostic Test kit based on antibody detection. The research results obtained are in accordance with the table.

Table 1. Results of Blood Serum Examination by Work Unit on Employees of the Sulawesi River Basin I.

Work unit	Interpretation	Amount
BWSS-I	IgM and IgG reaktive	0
	IgM reaktive	0
	IgG reaktive	3
	IgM and IgG non-reaktive	57
SATKER BALAI	IgM and IgG reaktive	0
	IgM reaktive	0
	IgG reaktive	0
	IgM and IgG non-reaktive	23

SNVT PJSa	IgM and IgG reaktive	0
	IgM reaktive	0
	IgG reaktive	0
	IgM and IgG non-reaktive	4
SATKER O&P	IgM and IgG reaktive	0
	IgM reaktive	0
	IgG reaktive	1
	IgM and IgG non-reaktive	7
SNVT PJPA	IgM and IgG reaktive	1
	IgM reaktive	0
	IgG reaktive	0
	IgM and IgG non-reaktive	10
SNVT Bendungan	IgM and IgG reaktive	1
	IgM reaktive	0
	IgG reaktive	0
	IgM and IgG non-reaktive	5
Amount		112

Source: Primary data

Table 2. Results of Serum Examination by Gender on Employees of the Sulawesi River Basin I

Gender	Interpretation	Amount
Man	IgM and IgG reaktive	1
	IgM reaktive	0
	IgG reaktive	4
	IgM and IgG non-reaktive	74
Woman	IgM and IgG reaktive	1
	IgM reaktive	0
	IgG reaktive	0

	IgM and IgG non-reactive	32
Amount		112

Source: Primary data

Table 4.3. Serum Examination Results for Employees of the Sulawesi River Basin I

Sample	Amount	Percentage (%)
IgM and IgG reaktive	2	1,79
IgM reaktive	0	0
IgG reaktive	4	3,57
IgM and IgG non-reactive	106	94,64
Amount	112	100

Source: Primary data

The results of the examination on 112 employees showed that if categorized by work unit there were three work units with reactive results with the most results being in the BWSS-I unit, namely three employees with reactive IgG followed by one SATKER O&M employee with reactive IgG results and one Dam SNVT employee with positive results. IgM and IgG are reactive. If categorized by gender, males showed more reactive results, namely five employees with details of four employees with reactive IgG and one employee with reactive IgM and IgG. In female, only one person was found with reactive IgM and IgG results. As for the total number of employees examined, six out of 112 employees had reactive results with details of four employees with reactive IgG and two employees with reactive IgM and IgG results.

3.2.Discussion

Research conducted on employees of the Sulawesi I River Basin Center on the detection of Anti-Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)

IgM IgG antibodies. Blood serum checks were carried out on 112 employees of the Sulawesi I River Basin I out of a total of 456 employees. Inspections cannot be carried out on all employees because other employees are not in Manado.

Serum was examined using the serum immunochromatography method, dripped on the test strip sample pad. Antibodies (IgM/IgG) present in blood serum will bind to the recombinant antigen present on the test strip to form an antigen-antibody complex. The antigen-antibody complex will bind to the anti-human antibody in the indicator area of the test strip so that it produces a color on the indicator and is interpreted according to the results obtained.⁽¹¹⁾

Antibodies that exist in the body are glycoproteins that will specifically bind to antigens or foreign microorganisms that enter the body.⁽²¹⁾ IgM is known to provide a primary immune response, which is an antibody that is first formed as an initial response to an infection. Meanwhile, IgG is known as providing a secondary immune response, which is an antibody that provides long-term immunity after an infection.⁽²²⁾

Examination with the immunochromatographic method is known to be easier to do when compared to the examination of COVID-19 with other methods so that it can be used in various situations. However, in addition to its convenience, there are drawbacks where this test cannot detect an increase in antibody titer. Therefore, the antibody detection test using the lateral flow immunoassay system is not recommended by WHO for acute diagnosis or clinical management.⁽⁹⁾ Meanwhile, medical personnel more often use examination with this method to make a

presumptive diagnosis or initial suspicion of a recent SARS-CoV-2 infection if the molecular examination results show negative results but there is a strong epidemiological link to SARS-CoV-2 infection. to the person concerned.⁽¹²⁾

Based on the blood serum examination of the employees of the Sulawesi I River Basin, two samples (1.79%) showed reactive IgM and IgG results, four samples (3.57%) showed reactive IgG results, and the remaining 106 samples (94.64%) showed non-reactive IgM and IgG results. Interpretation of the results in the two samples with reactive IgM and IgG results informed that the infection was suspected to have occurred more than 14 days and the immune system of the two samples had been active in producing antibodies both in symptomatic and asymptomatic conditions. Subjects with reactive IgM and IgG interpretations are required to immediately self-isolate and seek medical treatment according to symptoms if any symptoms are found.⁽¹¹⁾ 4 Blood serum samples with reactive IgG results can provide information that the immune system has produced IgG antibodies against recombinant antigens. virus in the examination kit. Both subjects have symptoms or asymptomatic, subjects with blood serum examination results showing reactive IgG are suspected to have had an infection for several weeks.⁽¹¹⁾ 106 samples with non-reactive IgM and IgG results can inform if antibodies are not and or have not been produced and the subject is suspected not to be infected with COVID-19. If the IgM and IgG are non-reactive while the subject experiences symptoms such as COVID-19, it is suspected that these symptoms are an infection that resembles COVID-19.⁽¹¹⁾

If categorized based on the work unit, the results obtained are in the BWSS-1 work unit there are three samples showing reactive IgG, the O&M SATKER work unit there is one sample showing reactive IgG results, and in the PJPA SNVT work unit and Dam SNVT each there is one sample showing the results IgM and IgG are reactive. The interpretation of the results of these examinations can inform that the immune system of the sample with reactive IgG results has formed IgG antibodies and is suspected of having an infection that lasts for several weeks. Interpretation of the examination with reactive IgM and IgG results can provide information that the sample's immune system has formed IgM and IgG antibodies against recombinant viral antigens on the examination equipment and is required to immediately self-isolate.⁽¹¹⁾

If categorized according to gender, one male sample and one sample showed reactive IgM and IgG, and four male samples showed reactive IgG. The interpretation of the examination with reactive IgM and IgG results can provide information that the sample's immune system has formed IgM and IgG antibodies against recombinant viral antigens on the examination equipment and is required to immediately self-isolate. Meanwhile, the results of reactive IgG provide information that IgG antibodies have formed and an infection is suspected to have lasted for several weeks.⁽¹¹⁾

Research conducted by Imai et al in February – March 2020 in Japan regarding clinical evaluation of antibody examination using the immunochromatographic method showed different results depending on the onset of disease and the presence or absence

of symptoms of SARS-CoV-2 infection in confirmed COVID-19 patients. Examinations conducted on 35 asymptomatic patients with sampling less than one week after confirmed COVID-19 infection by PCR showed that 40% of them had reactive IgM results and all samples showed non-reactive IgG results. In addition, examination of three asymptomatic patients with sampling ranging from 1-2 weeks after confirmed COVID-19 infection showed 1 of them had reactive IgM results and none showed reactive IgG. Meanwhile, examination of 53 symptomatic patients with confirmed COVID-19 with sampling less than one week after the onset of the disease gave the results of 17% (9/53) showing reactive IgM and reactive IgG of 3.8% (2/53). Examination of patients with disease onset 1-2 weeks showed 33.3% (4/12) gave reactive IgM results and 8.3% (1/12) showed reactive IgG results. The examinations carried out on confirmed COVID-19 patients with disease onset of more than two weeks showed 100% (9/9) giving reactive IgM results and 44.4% (4/9) showing reactive IgG results.⁽²⁷⁾

The study conducted by Zhao et al in January – February 2020 in China regarding the diagnostic value of antibody examination using the ELISA method in confirmed COVID-19 patients showed different sensitivity differences depending on the onset of the disease. Examination on day 1-7 after disease onset IgM sensitivity was 28.7%, IgG sensitivity was 19.1%, total antibody sensitivity was 38.3%. At 8-14 after the onset of the disease, the sensitivity values of IgM, IgG and total antibody increased by 73.3%, 54.1% and 89.6%, respectively. On days 15-39 after the onset of the disease, the sensitivity of IgM, IgG,

and total antibody showed a significant increase in the sensitivity of 79.8%, 94.3%, and 100%. In contrast to the diagnosis using RNA examination with samples from the respiratory tract, there was a decrease in sensitivity on days 1-7, 8-14, and days 15-39, namely 66.7%, 54%, and 45.5%. Meanwhile, the combined use of RNA examination and antibody examination showed a better increase in diagnostic sensitivity, namely days 1-7 by 78.7%, days 8-14 by 97%, and days 15-39 by 100%.⁽²⁸⁾

Interpretation of antibody test results depends on several factors including the duration of infection, clinical morbidity, testing equipment, validation methods, and the reliability of the results obtained. stronger in individuals with severe symptoms than in individuals with mild or no symptoms.⁽⁹⁾ This is consistent with a study conducted in China in January 2020 – February 2020 where there was a strong positive correlation between disease severity and antibody titers at two weeks after disease onset.⁽²⁸⁾

4. Conclusion

The results showed that 32% gave reactive IgM and IgG results, and 24% gave reactive IgG results. And there are 106 employees, 44% who gave non-reactive IgM and IgG results.

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