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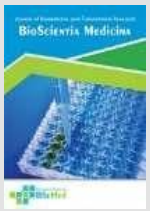

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Comparison of SARS-CoV2 IgG Antibody Levels in Health Workers with and without a History of COVID-19 Infection after Heterologous Vaccination at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia

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A B S T R A C T

Background: The COVID-19 pandemic, which has spread very quickly, has created crises in all aspects of life around the world. The administration of the COVID-19 heterologous vaccine in Indonesia is prioritized for high-risk groups, one of which is health workers. This study aimed to determine the comparison of quantitative IgG antibody levels for SARS CoV2 between health workers with and without a history of being infected with COVID-19 after heterology vaccination at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia. **Methods:** This study was a cross-sectional analytic observational study. A total of 64 subjects participated in this study. Data analysis was carried out with the help of SPSS software in univariate and bivariate. **Results:** SARS-CoV2 IgG antibody levels with and without a history of being infected with COVID-19 after heterologous vaccination did not find a significant difference in IgG levels between the two groups. However, the quantitative IgG levels of SARS-CoV2 in the infected history group were greater, namely 4834.25 AU/mL, compared to no history of COVID-19 infection of 3833.35 AU/mL **Conclusion:** There is a difference in the average SARS-CoV 2 IgG between subjects with a history of being infected with COVID-19 and without a history of COVID-19 at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia, although statistically, it is not significantly different.

1. Introduction

At the end of 2019, in December, to be precise, the world was shocked by the news of the emergence of a pneumonia outbreak with no known exact cause. This outbreak was first discovered in the city of Wuhan, Hubei Province of China. On January 7th, 2020, researchers managed to identify the cause of this pneumonia, namely a type of novel coronavirus.[1] Officially, WHO named this disease COVID-19 (Corona Virus Disease 2019), and the name of the virus is SARS-CoV2 (Severe Acute Respiratory Syndrome Coronavirus).[2] Globally, as of October 9th 2021, 225 countries have been confirmed with COVID-19, with a total of 238,324,540 cases and 4,862,196 deaths.[3] COVID-19 was first reported in Indonesia on March 2nd, 2020 with a total of two cases. According to WHO,

until October 9th, 2021 in Indonesia, there were 4,227,038 positive cases of COVID-19 and 142,612 deaths.[4] In South Sumatra, the first confirmed case of COVID-19 was found on March 24th, 2020. Until October 2nd, 2021 there have been 59,367 positive confirmed cases.[5]

The COVID-19 pandemic, which has spread very quickly, has created crises in all aspects of life around the world. WHO has implemented various health protocols to control the spread of COVID-19. The primary prevention effort that is thought to be more effective is the establishment of herd immunity, which can be achieved safely through vaccination.[6] The management of COVID-19 vaccination aims to stop the COVID-19 outbreak. At present, there are many new variants of COVID-19, so the effectiveness of homologous vaccination is doubtful for these new variants, and heterologous vaccination is being developed, which is expected to control the spread of COVID-19. Giving priority to the delivery of the COVID-19 heterologous vaccine in Indonesia for high-risk groups, one of which is health workers. Health workers are a population that is very at risk of infection because they have been at the forefront of handling COVID-19 since the start of the pandemic.[7] Health workers in Indonesia are at eight times higher risk of being infected with COVID-19 compared to non-medical workers.[8] This study aims to determine the comparison of quantitative IgG antibody levels for SARS-CoV2 between health workers with and without a history of being infected with COVID-19 after heterology vaccination at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

2. Methods

This study was an analytic observational study with a cross-sectional approach. A total of 64 research subjects participated in this study. The research subjects met the inclusion criteria, namely health workers aged 18 to 59 years and health workers who received the Sinovac vaccine twice and received the Moderna vaccine booster once and were willing to take part in this study. This study was approved by the medical and health research ethics committee at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

This study presents data on the basic characteristics of research subjects, such as age, gender, body mass index, comorbidities, and time or history of being infected with COVID-19. SARS-CoV2 IgG antibody levels were assessed quantitatively using the ECLIA examination method. Blood was taken from a peripheral vein of as much as 5 cc. The blood specimen was put in a vacutainer, then taken to the Laboratory of Dr. Mohammad Hoesin General Hospital Palembang to be centrifuged at 3000 rpm for 20 minutes and to obtain serum. After that, the serum was stored at -20°C. Furthermore, SARS-CoV2 IgG antibody levels were analyzed using the ECLIA method according to the laboratory examination protocol at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia. Data analysis was carried out with the help of SPSS version 25 software. Univariate analysis was carried out to present the frequency distribution of research variable data. Bivariate analysis was performed to assess the relationship between research variables with a $p<0.05$ value.

3. Results

Table 1 shows the characteristics of the research subjects. The majority of research subjects are of productive age in the age range of 26-45 years. The majority of research subjects were female and had a normoweight body mass index. Most of the research subjects had a comorbid history of drug allergies and had a history of being infected with COVID-19 for less than 3 months.

Table 1. General characteristics of research subjects.

Variable	Research subject (n=64)	History of infection		P
		History of infection with COVID-19 (n=32)	No history of infection with COVID-19 (n=32)	
Age				0.402*
≥ 60 Years	6 (9.4%)	1 (3.13%)	5 (15.6%)	
56 – 59 Years	3 (4.7%)	2 (6.25%)	1 (3.1%)	
46 – 55 Years	6 (9.4%)	4 (12.5%)	2 (6.3%)	
36 – 45 Years	12 (18.8%)	7 (21.87%)	5 (15.6%)	
26 – 35 Years	37 (57.8%)	18 (56.25%)	19 (59.4%)	
Gender				0.794*
Male	23 (35.9%)	11 (34.4%)	12 (37.5%)	
Female	41 (64.1%)	21 (65.6%)	20 (62.5%)	
Body mass index				0.950*
Obesity II	7 (10.9%)	4 (12.5%)	3 (9.4%)	
Obesity I	14 (21.9%)	6 (18.8%)	8 (25.0%)	
Overweight	8 (12.5%)	4 (12.5%)	4 (12.5%)	
Normoweight	28 (43.8%)	15 (46.9%)	13 (40.6%)	
Underweight	7 (10.9%)	3 (9.4%)	4 (12.5%)	
Comorbid				
Asthma	5 (7.8%)	4 (12.5%)	1 (3.1%)	0.355**
DM type 2	2 (3.1%)	1 (3.1%)	1 (3.1%)	1.000**
Hypertension	2 (3.1%)	1 (3.1%)	1 (3.1%)	0.433*
Hyperthyroid	2 (3.1%)	0 (0%)	2 (6.3%)	0.492**
Medicine allergy	12 (18.8%)	6 (18.8%)	6 (18.8%)	1.000**
Time of exposure to COVID-19 before vaccination	-		-	-
> 6 months		1 (3.1%)		
3 – 6 months		9 (28.1%)		
< 3 months		22 (68.8%)		

*=Chi-square, **=Fisher's exact, p>0.05 = not significant.

Table 2 shows a comparison of SARS-CoV2 IgG levels between subjects who had been infected with COVID-19 and those who had never been infected with COVID-19. Study subjects who had a history of being infected with COVID-19 had a higher average IgG antibody level for SARS-CoV2 than subjects who had never been infected with COVID-19, although this was not statistically significant.

Table 2. Comparison of average SARS-CoV2 IgG levels.

Variable	Antibody IgG SARS CoV-2	
	Mean (Min-Max) (U/mL)	p-value*
History of infection with COVID-19	4834,25 (1121.40-19464.7)	0.116
No history of infection with COVID-19	3833.35 (69.30-29178)	

*Mann Whitney test.

4. Discussion

Individuals with a history of infection have antibody levels that are formed naturally and are induced by antibodies from vaccination. This is called hybrid immunity.[9-12] There is a role for the memory B cell compartment in generating a strong neutralizing humoral response.[13,14] Antibodies formed with hybrid immunity have a longer half-life so that the reduction level is relatively more stable than antibodies without hybrid immunity. Therefore natural infection followed by COVID-19 vaccination-induced antibody responses were more durable than natural SARS-CoV-2 infection

or just 2 doses of COVID-19 vaccination. This may be the underlying reason that the group with a history of infection had IgG levels that were still very high compared to the group without a history of infection in our study.[15-17]

A study found that in individuals who were previously infected, who had quantitative IgG levels before the vaccine higher than individuals who had never been infected with COVID-19, after receiving one dose of mRNA vaccine, the quantitative IgG levels would similarly fall at 6-7 months, with a slightly higher reduction rate in patients with no previous infection.[18,19] The risk of reinfection among individuals who were infected before vaccination is proportional to the proportion of infections among never-infected individuals who received 2 doses of vaccine.[20,21] These findings indicate that hybrid immunity will still decrease over time, so it still requires a booster to increase antibody levels. Another study stated that after 6 months post-vaccination, quantitative IgG levels of SARS CoV-2 were higher in subjects who received the mRNA vaccine and accompanied by a history of the previous infection compared to subjects who received two doses of m-RNA vaccine but without a history of the previous infection. There was a significant relationship between the two groups with a p-value <0.005.[22-24] This is related to the natural infection of SARS-CoV-2, which produces high levels of antibodies naturally and is induced by the COVID-19 vaccination and is called hybrid immunity. Antibodies produced by hybrid immunity are considered to have a longer half-life than those without hybrid immunity.[25]

5. Conclusion

There is a difference in the average SARS-CoV 2 IgG between subjects with a history of being infected with COVID-19 and without a history of COVID-19 at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia, although statistically, it is not significantly different.

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