Conference Paper

Comparison of Antibody Titers From COVID-19 Survivors and Health Workers Getting Two Doses of the Sinovac® Vaccine

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Abstract.
Almost two years since becoming a global threat, the whole world is still looking for the best way to reduce the rate of transmission of COVID-19. One of the ways to deal with COVID-19 is to increase immunity by stimulating antibodies in the community. Antibody-mediated humoral responses are critical to prevent viral infections. Antibodies can also be formed through natural processes when someone is infected by SARS-Cov2 or through vaccination programs. In this study, collective blood samples were taken to examine IgG spike receptor binding domains (IgG S-RBD) between two groups: COVID-19 survivors (n = 50) and health workers who were vaccinated twice with the Sinovac vaccine (n = 50). There were no significant differences in antibody levels between the previous COVID-19 infection group and the health workers groups (p = 0.8). 50% (n = 6) of the health workers who were aged 30-39 had excellent titer antibody levels, as did 50% (n=7) of the COVID-19 survivors group who were in their 30s. Further research is needed to decide the perfect time for booster shots.

Keywords: COVID-19, titer antibody, IgG S-RBD, Sinovac

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1. Introduction

Almost two years since becoming a global health threat, the whole world is still looking for the best way to reduce the rate of transmission of COVID-19. There were at least 4.185.144 covid-19 confirmed case recorded with 140.138 mortality case in Indonesia [1]. Health workers had a high risk for Covid-19 exposure, as per 24 August 2021, at least 1967 mortality cases were recorded among Indonesian Health Workers, placed Indonesia as the highest health worker death rate due to Covid-19 in Asia.

The immune memory, either from primary covid-19 infection or vaccination was one of the way to deal with Covid-19 was to increased immunity by stimulating immune competence in the community [2]. Antibody-mediated humoral responses were critical

to prevent viral infections [3]. And also activated from natural processes when someone was infected by SARS-Cov2 or by vaccination programs. Therefore, Indonesian Government started the Covid-19 Vaccination Program by January 2021, whilst the health worker were being the first group to be injected by Covid-19 vaccine using Sinovac (Inactivated Vaccine).

Covid-19 caused by SARS-Cov2 strain was an enveloped positive-strand RNA virus featuring replycase proteins such as the spike (S), envelope (E), Matrix (M) glycoproteins, the nucleocapsid protein (N), and other proteins (4–6). The S protein that contains S1 domains RBD playing the big role as its capability to initiate the binding of Sars-Cov2 to angiotensin converting enzyme-2 (ACE-2) receptor on human target cell. The similarity of RBD amino acids were believed as the inducer of Covid-19 neutralizing antibodies, by its mechanism to block the ACE-2 receptor binding site (7,8).

Recent studies show that neutralizing antibodies were shown as protective immunity for secondary Covid-19 infection on convalescence group. The Sars-Cov2 Spike IgG titers were expected to stay from 20-240 days post symptoms onset [9].

This study demonstrated the difference of antibody titers from two different group, Covid-19 Survivor and Health Workers getting two doses of Sinovac vaccine to know which groups had a better possible neutralizing antibodies protections against covid-19 infection.

2. Material and Method

This was an observational cross-sectional study to examine IgG Spike Receptor Binding Domains (IgG S-RBD) in Muhammadiyah University General Hospital of Malang. A collective blood sample were taken from 100 employes on August 2021. They were divided into two groups; survivor Covid-19 groups (n=50) those who had confirmed Covid-19 seven months earlier and health workers who got two doses of Sinovac vaccine (n=50). On health worker groups, the first shot were given on February 2021. Blood specimens were obtained by standard venipuncture and were tested to the laboratory on the day of collection. On arrival at the laboratory, the samples were tested using Chemiluminescence Immunoassay (CLIA) System and titer IgG S-RBD were collected. Analysis was done by using SPSS software version 25.

3. Results and Discussion

In total, there were 100 patients in the study. The demographic of the groups are given in Table 1. There were 100 blood sample collected to examine the IgG S-RBD titer, divided into two groups. A group for Covid-19 survivor (n=50), and health workers who got two doses of Sinovac Vaccine (n=50) groups. The largest population on both groups were female; Covid-19 survivor 56% (n=28) and vaccinated group 64% (n=32). Based on age, the highest population on Covid-19 survivor groups (n=24) were people age 20s. Meanwhile, on vaccinated group the highest population were people age 30s (n=25).

There were no significant differences in antibody levels between previous Covid-19 infection groups and health workers groups (p=0.8). As known the Covid-19 survivor were infected on January 2021, so the blood sample were collected eight month after infection. Meanwhile, the health workers got the first shot on February 2021, so the blood sample was taken seven month after the second shots. The study about immunological theory, proved that IgG to the Spike protein was relatively stable over 6 months (10).

TABLE 1: Demographic of the groups.

Demographic	Covid-19 Survivor group (n=50)	Vaccinated group (n=50)
Gender		
Male	22 (44%)	18 (36%)
Female	28 (56%)	32 (64%)
Age		
20s	24 (48%)	24 (48%)
30s	21 (42%)	25 (50%)
40s	5 (10%)	1 (2%)

As we know the antibody production was a main function of the immune system and was carried out by B cells. When an antigen substance enters the body, the antigen binds to the receptor and was taken inside the B cell by endocytosis. The antigen is processed and presented on the B cell's surface again by MHC-II proteins. The B cell waits for a helper T cell (TH) to bind to the complex. This binding will activate the TH cell, which then releases cytokines that induce B cells to divide rapidly, making thousands of identical clones of the B cell (shown at Figure 1) . These daughter cells either become plasma cells or memory cells. The memory B cells remain inactive here; later, when these memory B cells encounter the same antigen due to reinfection, they divide and form plasma cells. On the other hand, the plasma cells produce a large number of antibodies which are released freely into the circulatory system [9].

Protective antibodies were produced during the first contact to the antigen and in a larger amount on the secondary responses. Antibodies bind to neutralize the infectivity of the pathogen. They attach to the envelope of the pathogen to protect the host from infection. Neutralization is a defense mechanism because it does not allow an infection to take hold.
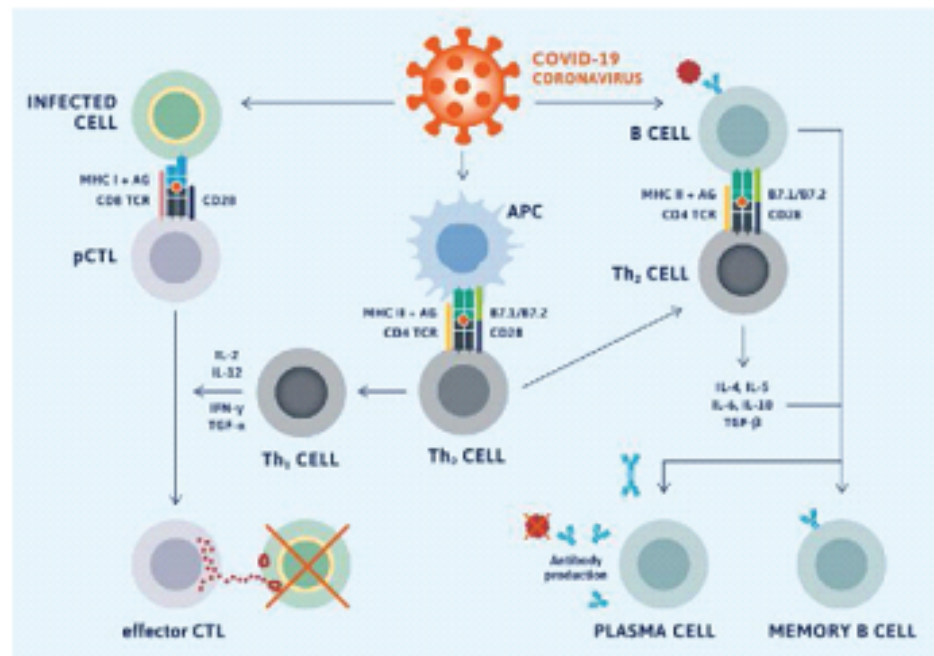

Figure 1: Adaptive immune response against coronavirus requires stimulation of B cell and T cell epitopes (11).

SARS-Cov2 spike IgG titers were stable from 20-240 days post symptom onset of covid-19 infections. While B-Cell had a immune memory that increased over the first 120 days , then plateaued. The immune memory from primary infections was expected to reduce the severity of disease , in the case of reinfection. But, there was limited knowledge of memory B-cell to protect from acute viral infection in humans, based on heterogeneous renponse against SARS-Cov2 between individuals (10).

Previous infectious disease control suggested Innactivated Vaccine, as the first generation vaccine to prevent the spread of infectious disease, including SARS-cov2 and MERS [8]. This study measured antibody IgG S-RBD induced by Inactivated Sars-Cov 2 vaccine (Sinovac) . Prior study shown that Sinovac has been considered as the vaccine candidate by its ability to induced high titers of antibodies specific for S-protein especially for RBD in animals [7] and its capability to induced neutralizing antibodies and protective immunity (8,12,13).

We did not yet know the minimum neutralizing activity required for protection from re-infection or the sustainability of the protection. However, the possibility of predicting

neutralizing activities at both individual and population level using an automated high-throughput high performance serological test will bring us one step closer to the understanding of COVID-19 immunity. In addition we reported about persistence antibody levels between those two groups, both of the groups shown that seven months after viral induction (by infected or vaccinated), the antibody levels should be decrease slowly [9].

4. Conclusion

The antibody levels were not significantly different between two groups. It tends to be higher titer antibody IgG S-RBD on Covid-19 survivor groups. Since there was decreased concentration level of antibody between those two groups, we recommended some boosters given six months after the exposure to Covid-19. However, a further research is needed to decide when the perfect time to boost after the last shots.

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