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Research Article

Relationship between antibody titer than the Incidence of Infection After Complete Dose of COVID-19 Astrazeneca Vaccination Based on Sociodemographics

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Abstract

Background: Vaccine is an essential tool to limit the health of the COVID -19 pandemic and one of the vaccines that got permitted to used is AstraZeneca Vaccine. The base of the AstraZeneca is the viral vector vaccine. This vaccine has a more advanced method that uses a modified virus to trigger antibodies to make herd immunity for people.

Objective: To found correlation between antibody titer than the incidence of Covid infection after complete dose vaccination base on sociodemographics

Method: Observasional prospective Cohort method was use in this study with a convenience sampling design. Inclusion criteria were all Indonesian citizens above 18 years old (n=113) who were vaccinated at UTA 45 Jakarta Vaccine Center with no history of COVID -19 before the vaccination and had filled up the informed consents.

Results: there were 43 (38%) respondents infected Covid-19 after vaccinated full doses

Conclusion: Base on this study, it was found that there was a correlation between sociodemographics after vaccinated full doses AstraZeneca, gender, age, comorbid, smoking, and drinking than infected Covid -19 (P-value < 0.05)).

Keywords: Astrazeneca vaccine, Antibody titer, COVID-19.

Introduction

The COVID-19 virus has spread in various countries, including Indonesia. On March 2nd 2022 President Joko Widodo reported two confirmed cases of COVID-19 infection for the first time in Indonesia. Knowledge as of April 2 reached 1,790 confirmed cases, 113 new cases, 170 deaths and 112 recoveries [1,2]. The pandemic caused by the new coronavirus, SARS-CoV-2, has become one of the public health problems in human history. One effort to suppress the Covid-19 pandemic is by administering mass vaccines to all elements of society [3]. By administering the AstraZeneca vaccine, it is hoped that the body's immune system will immediately increase so that antibodies will appear. The main aim of Covid-19 vaccination is to create herd immunity so that people become more productive in carrying out their daily activities [4].

Covid-19 vaccination is an important part of efforts to handle the Covid-19 pandemic in a comprehensive and integrated manner, including preventive aspects, with the hope of building community immunity. The main objective of this research is to prove that administration of the AstraZeneca Covid-19 vaccine affects antibody titer values. These vaccines may vary in terms of side effects, immunogenicity, efficacy and duration of protection [5].

One of the things that can trigger the formation of antibodies and give rise to active immunity in preventing disease is vaccination, namely biological treatment that contains antigens [6,7]. Vaccination aims to prevent transmission of the virus from an infected host to the recipient [8]. Vaccination creates an immune system in the body so that it can prevent or reduce the possibility of pathogen infection occurring in the future [9]. There are 2 categories of the antibody titer values: the low antibody (< 110 U/mL) and high antibody (> 110 U/mL) [10].

AstraZeneca is one of the COVID-19 vaccines, developed at the University of Oxford which consists of a replication-deficient adenoviral vector containing the SARS-CoV-2 structural glycoprotein antigen gene [11]. According to the research that held on England and Brazil AstraZeneca vaccine or ChAdOx1nCoV-19 (AZD1222) had proven 70.4% of the society (18-55 years old) that got AstraZeneca vaccine more than 14 days had mild symptoms [11,12].

Material and Methods

This study used a prospective cohort observational method with a convenience sampling design. The inclusion criteria were all Indonesian citizens aged over 18 years (n=113) who had been vaccinated at the UTA 45 Jakarta Vaccine Center, had no history of COVID-19 before vaccination and had fulfilled the informed consent.

Results

Table 1: Antibodies Titer After Vaccination with Respondents Infected with Covid-19 after a Complete Dose of Vaccination.

Infected	Antibody 2 N (%)		Total	*P-value*
	Low	High		
No	1 (1.4)	69 (98.6)	70 (61.9)	0.029
Yes	5 (11.6)	38 (88.4)	43 (28.1)	

Fisher exact

Table 2: Correlation between Sociodemographics and Clinical Outcome of the Respondents which Infected by Covid-19

Sociodemographics	Indicators	Infected N (%)		Total	*P-value*
		No	Yes		
Gender	Female	23 (79.3)	6 (20.7)	29 (25.7)	0.028
	Male	47 (56.0)	37 (44.0)	84 (74.3)	
Age	< 35	56 (68.3)	26 (31.7)	82 (72.6)	0.031
	35-45	5 (33.3)	10 (66.7)	15 (13.3)	
	45-55	6 (45.2)	7 (54.8)	13 (11.5)	
	>55	3 (100)	0 (0.0)	3 (2.7)	
Comorbidity	No	48 (80.0)	12 (20.0)	60 (53.1)	0.000
	Yes	22 (41.5)	31 (58.5)	53 (46.9)	
Exercise	No	16 (64.0)	9 (36.0)	25 (22.1)	1.00
	Yes	54 (61.4)	34 (38.6)	88 (77.9)	
Smoke	No	63 (66.3)	32 (33.7)	95 (84.1)	0.036
	Yes	7 (38.9)	11 (61.1)	18 (15.9)	
Drink alcohol	No	68 (65.4)	36 (34.6)	104 (92.0)	0.028
	Yes	2 (22.2)	7 (77.8)	9 (8.0)	

According to Table 1, the results show 5 of 6 respondents who had a lower antibody titer were exposed by the covid-19 virus. But Respondents who had higher antibody titer only had 35.514% chance to expose by covid-19 virus.

From Table 2, male respondents tend had a higher exposure of the covid-19 virus the female respondents. More 44% male respondents had infected by covid-19 virus. A higher percentage of the covid-19 infection had found on participants with age between 35-45 years old (66.7%).

The respondent who has comorbidity had a higher chance to expose covid-19 virus. There were 31 respondents (58.5%) with comorbidities had exposure to Covid-19, but only 12 of 60 respondents (20.0%) who were exposed to Covid-19 with no comorbidities. Either participant which had a habit of smoking and drinking alcohol tend to higher percentage exposed by Covid-19.

Discussion

This research was carried out for 2 years, during the research process it was discovered that there were vaccination participants at UTA'45 Jakarta. It was found that there was a relationship between vaccine participants who were exposed to Covid-19 after the second vaccination and the second antibody in the vaccination participants. This is comparable to research in 2021 which said there was a strong relationship between antibody titer values and vaccine efficacy [13]. Previously infected participants resulted in high positive and quantitative levels of antibodies, anti-spike IgG [14].

Viral serology testing is an effective diagnostic method to determine the presence/absence of SARS-CoV-2 infection. Where the presence of SARS-CoV-2 infection is indicated by the positive rate and variance in IgG titers which are higher than IgM in Covid-19 patients [15,16].

Most people with mild to moderate Covid-19 infections have a strong immunoglobulin G antibody response to the viral spike. The antibody titer and anti-spike binding titer were relatively stable for at least a period of about 4 months and there was a significant correlation between antibody titer and neutralizing serum levels (nAbs) [17,18]. The level of neutralization could predict immune protection and provide immune protection against Covid-19, this titer is relatively stable for 12.5 months after infection [19,20]. Another study found that SARS-CoV 2 antibody titer values persisted for up to 1 year after initial seropositivity, indicating the existence of long-term natural immunity [21].

In this study, it was found that there was a significant relationship between sociodemographics such as comorbidities, smoking and drinking alcohol and vaccine exposure among participants. Vaccination participants who have comorbidities will be more easily exposed to Covid-19 by

58% and may even be at risk of the disease becoming more severe and causing death [22]. In addition, the genetic diversity of the person who inherits it influences the immunological response [23].

According to the table 2, male respondents had a higher percentage to be infected by covid-19 virus then female respondents. Most of the males according to the several journals tend to habit of smoking and drinking alcohol [24–29], and this has been found correlated in this journal. Most of the respondents that had habit of smoking dan drinking alcohol tend to be infected by covid-19.

Smoking habits can reduce the number of lymphocytes and platelets, so that immunity can be reduced [30]. Apart from that, smoking habits can also increase gene expression for C-reactive protein, lipopolysaccharide and lipoteichoic acid which will explain the increase in IFNγ, IL-1β, IL-6, and TNFα [31]. As a result of increased, people who have the habit of smoking and drinking alcohol have a lower recovery rate than people who do not smoke and drink alcohol [30,31]. According to another journal vaccination participants who have a smoking habit have a higher risk of contracting the Covid-19 virus and have a worse prognosis for the Covid-19 virus and its accompanying diseases [32,33].

The relationship between bacterial and viral infections and alcohol use is caused by the following pathophysiological mechanisms, namely: reducing the number of T lymphocytes, preventing proliferation, increasing inflammatory cytokines such as TNF-α and interleukins (IL-1, IL-6), reducing the number of NK cells (Natural killer) which is responsible for removing infected cells, and disrupting the function of macrophages in lung alveolar cells. Another factor is also caused by malnutrition due to excess alcohol consumption which can damage the digestive tract, causing a decrease in the absorption and metabolism of vitamins such as Vitamin B (B1, B6, B9, folic acid) which slows leukocyte proliferation. Defense mechanisms in the mucosal immune system also cause dysfunction of IgA and IgG [34,35].

Comorbidity had been shown a significant correlation with the covid-19 infection. Respondent with comorbidity had a higher risk of covid-19 infection. A higher ACE-2 expression had been found in the person who had comorbidity and higher age [36]. ACE-2 is a receptor of the binding side to covid-19 virus [36–38].

Conclusions

There were several factors that impact on efficacy of the vaccine. Most of them are gender, age, comorbidity, smoking and drinking alcohol habits. Comorbidity, smoking and drinking alcohol had higher impact on production of the antibody titer.

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Conflicts of Interest

The authors declare no conflict of interest

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