ISSN: 2577-8455

Research Article

Archives of Infectious Diseases & Therapy

Antibody Levels with Cut off Points of 30 IU/ml blood, 50 IU/ml blood, and 80 IU/ml blood after Employees Administering the Second Dose of the Covid19 Vaccine at Bontang Islamic Hospital (RSIB) in March, May and August 20

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Submitted: 02 Mar 2023; **Accepted:** 10 Apr 2023; **Published:** 18 Apr 2023

Citation: Windiyaningsih, C., Sawali, M., Kridawati, A., Yanuar, E. S. (2023). Antibody Levels with Cut off Points of 30 IU/ml blood, 50 IU/ml blood, and 80 IU/ml blood after Employees Administering the Second Dose of the Covid19 Vaccine at Bontang Islamic Hospital (RSIB) in March, May and August 20. *Archives of Infect Diseases & Therapy, 7*(1), 42- 49.

Abstract

Several types of vaccines from the results of phase 3 trials such as mRNA vaccines were developed by American companies, namely Moderna and Pfizer which have been tested for the first time in humans on March 16 2020 in America, Brazil has also been vaccinated with the Sinovac Biotech China covid-19 vaccine in March January 2021 was reported to have an efficacy of 78%, in Turkey 91.25% and in Indonesia 65.3%. The aim of the study was to evaluate antibody (Ab) levels after the second dose of vaccination on day 14, 3 months, 6 months, with cut-off point Ab 30 IU/ml blood; 50 IU/ml of blood and 80 IU/ml of blood after being given the second dose of the covid19 vaccine, as well as factors that influence it such as gender, age and nutritional status. The research method of the Covid19 vaccine intervention study was given two doses, the number of respondents was 93 persons who were selected who had completed the second dose of vaccination and had their antibodies checked on day 14, 3 months and 6 months using the ELISA test method with cut-off point Ab 30 IU/ml blood; 50 IU/ml of blood and 80 IU/ml of blood after being given the second dose of the covid19 vaccine, as well as factors that influence it such as gender, age and nutritional status. The analysis was descriptive and analytic with Chy Square analysis and multinominal logistic regression. Results based on gender the majority were women 58.1%, adult age 92.5%, normal nutritional status 64.5%; 14 days after the second dose of Covid19 vaccination, the Ab level according to the cut-off point is ≥ 30 IU/ml amount 50.5% peoples, titer ≥ 50 IU/ml, the number is 43%; ≥80 IU/ml the number is 31.2%. 3 months Ab ≥ 30IU/ml amount 52.7% ≥ 50IU/ml amount 34.4%, ≥80IU/ml amount 24.7%; 6 months, sex has a significant effect only 6 months after vaccination with levels Ab≥30 IU/ml 66.7%, Ab≥50 IU/ml 50.5%, Ab≥ 80 IU/ml 41.9%peoples. Gender affects Ab levels at 6 months with Ab Cut off Point 30 IU/ml (p value 0.034, OR 0.396.95%CI 0.166-0.941) and Ab50 IU/ml (p value 0.033, OR 0.384.95%CI 0.157-0.936). Nutritional status affected Ab levels on day 14 with an Ab titter of 30IU/ml blood (p value 0.043, OR 2450.95%CI 1021-5880) and at 6 months with an Ab titre of 50IU/ml blood (p value 0.014, OR 3000, 95% CI 1.233-7.299). The conclusion that BMI has an effect on Ab levels is 50 IU/ml blood, the effect is 8.5%, 6 months the most dominant variable in the formation of antibodies is gender, male good improved Ab days 14, and Female 6 moths was good increased Ab.

Keywords: Antibody, BMI, Covid19 Vaccination, Gender.

Introduction

The development and testing of vaccines for COVID-19 is an urgent and crucial task to save human populations worldwide. Many countries, including China, are conducting clinical trials on drugs that are already available in the market to identify which ones are most effective in treating COVID-19 patients. Traditional inactive vaccines, as well as new technologies such as mRNA/DNA vaccines, engineered genetic vaccines, and adenovirus-based vector vaccines, are being developed by hundreds of companies worldwide. The development of vaccines is a challenge that requires coordination between the scientific and medical communities, government, and regulatory agencies to ensure efficacy and safety.

As of March 1, 2020, there were five vaccines that had entered phase IV clinical trials, including Pfizer/BioTech+Fosum Pharma (BNT162b2), Moderna+National Institute of Allergic and Infectious Disease (mRNA-1273), AstraZeneca+University of Oxford (AZD1222), Sinovac Research and Development Co. (CoronaVac), and Janssen Pharmaceutical (Ad26.COV2.S by Johnson and Johnson) [1]. More than 200 preclinical and clinical candidates have been identified. The achievement of herd immunity through natural post-infection or artificial immunization (vaccination) is essential to prevent the spread of SARS-CoV-2 and millions of new infections and deaths from COVID-19.

The success of vaccines in preventing the spread of epidemic H1N1 influenza, Ebola, Zika, and other diseases has provid-

ed a basis for developing vaccines for COVID-19. As of July 2020, the World Health Organization reported that 170 vaccines had reached clinical trials and 198 were still in preclinical development. In January 2021, the Sinovac Biotech vaccine for COVID-19 was reported to have an efficacy of 78% in Brazil, 91.25% in Turkey, and 65.3% in Indonesia. Indonesia has set a target to vaccinate 181.554.465 people, starting with 1.629.223 healthcare workers, within 15 months (KCPEN) [2].

The World Health Organization (WHO) reported on February 2, 2021 that there were 103,116,863 confirmed cases of COVID-19 worldwide and 2,235,410 deaths, resulting in a case fatality rate (CFR) of 2.1% [3]. In Indonesia, there were 1,099,687 confirmed cases and 30,581 deaths, resulting in a CFR of 2.7%, which is higher than the global CFR [4]. As there is currently no drug of choice for treating COVID-19, the world is relying on vaccines for prevention and to reduce COVID-19-related deaths. Therefore, an evaluation of antibody titer after the second vaccine dose is needed to determine antibody levels at day 14, 3 months, and 6 months. There are already several types of vaccines that have completed phase 3 trials, such as the mRNA vaccines developed by American companies Moderna and Pfizer, which were first tested in humans on March 16, 2020, in the United States. Brazil has also started vaccinating with the Sinovac Biotech China COVID-19 vaccine, which was reported to have an efficacy of 78% in January 2021, 91.25% in Turkey, and 65.3% in Indonesia. Indonesia has set a target of vaccinating 181,554,465 people, starting with 1,629,223 healthcare workers. This vaccination effort is expected to take 15 months, according to KPCPEN [2].

To prevent the spread of SARS-CoV-2 and achieve herd immunity, it is crucial to have a coordinated effort between the scientific and medical community, government, and regulatory agencies to ensure the safety and efficacy of COVID-19 vaccines. As of July 2020, the World Health Organization (WHO) had noted that more than 170 vaccines had entered clinical trials, with 198 still in pre-clinical development.

The effectiveness of vaccines varies across different regions and populations, as seen in the different efficacy rates of the Sinovac Biotech China COVID-19 vaccine in Brazil, Turkey, and Indonesia. However, the availability and widespread use of vaccines are essential in preventing millions of new infections and deaths from COVID-19. Indonesia, for example, has set a target to vaccinate 181.554.465 people, starting with 1.629.223 healthcare workers within 15 months.

As of February 2021, COVID-19 had infected more than 103 million people globally, resulting in over 2 million deaths. CFR (case fatality rate) varies across different regions, with Indonesia having a higher CFR than the global average. With no effective drug for treating COVID-19, vaccines offer hope in preventing the spread and reducing deaths caused by COVID-19. It is important to conduct evaluations of antibody titre after the second vaccine dose to assess immunity levels at various time points, such as 14 days, 3 months, and 6 months. Several vaccines have already completed phase 3 trials, such as mRNA vaccines from Moderna and Pfizer, and the Sinovac Biotech China COVID-19 vaccine.

The objectives of the study are:

1. General Objective

To prove the influence of gender, age, and nutritional status on antibody levels in the human body on day 14, 3 months, and 6 months after two-dose vaccination with a cut-off point of 30IU/ml, 50 IU/ml, and 80IU/ml blood at the Islamic Hospital of Bontang, East Kalimantan, Indonesia.

2. Specific Objectives

1. To determine the distribution and frequency of gender, age, nutritional status, and antibody levels on day 14, 3 months, and 6 months with a cut-off point of 30IU/ml blood, 50IU/ml blood, and 80IU/ml blood among employees of the Islamic Hospital of Bontang, East Kalimantan, Indonesia.

2. To prove that gender, age, and nutritional status have an effect on antibody levels on day 14, 3 months, and 6 months with a cut-off point of 30IU/ml blood, 50IU/ml blood, and 80IU/ml blood among employees of the Islamic Hospital of Bontang, East Kalimantan, Indonesia.

3. To determine the most influential factor on antibody levels on day 14, 3 months, and 6 months with a cut-off point of 30IU/ml blood, 50IU/ml blood, and 80IU/ml blood among employees of the Islamic Hospital of Bontang, East Kalimantan, Indonesia.

The research method used in this study is an intervention study of the Sinovac Covid19 vaccine, where the respondents were given two doses of the vaccine. The study involved a total of 93 participants who completed two doses of the vaccine and had their antibody levels checked on day 14, 3 months, and 6 months using the ELISA test method with cut off points for antibody titre of 30 IU/ml blood, 50 IU/ml, and 80 IU/ml.

The analysis used in the study was both descriptive and analytic, with Chi-square analysis and multinomial logistic regression being employed. The factors influencing antibody levels that were analysed in the study include gender, age, and Body Mass Index (BMI).

Overall, the study aimed to prove the influence of gender, age, and BMI on antibody levels in humans on day 14, 3 months, and 6 months after receiving the Sinovac Covid19 vaccine, with cut off points of 30 IU/ml, 50 IU/ml, and 80IU/ml. The specific objectives of the study included determining the distribution and frequency of gender, age, and BMI, as well as the antibody levels on days 14, 3 months, and 6 months, and to determine which factors had the greatest impact on antibody levels at each of these time points.

Table 1: Distribution and Frequency of Gender, Age, and Body Mass Index of Employee Islamic Hospital Bontang, East Kalimantan

1	Gender Male Female	39 54	41.9 58.1
2	Age 22-45 years 46-60 years	86 7	92.5 7.5
3	Body Mass Index Normal 18-25 Up normal 25.1-36	60 33	64.5 35.5

Base table 1 gender majority female 58.1%, age 22-45 years old amount 92,5%,body mass index normal (18-25) amount 64.5%.

Table 2: The distribution and Frequency Titer Antibody Days 14, 3 Months, 6 Months with Cut of Point Antibody 30 IU/ml, 50 IU/ml, 80 IU/ml Post Vaccination Sinovac Two Doses of Employee Islamic Hospital Bontang, East Kalimantan

Tier Antibody	14 Days Number and %	3Mothns Number and %	6 Months Number and %
<30 IU/ml	46 (49.5%)	44(47.3%)	31 (33.3%)
≥30 IU/ml	47 (50.5%)	49 (52.7%)	62 (66.7%)
<50 IU/ml	53 (57%)	61 (65.6%)	46 (49.5%)
≥ 50 IU/ml	40 (43%)	32 (34.4%)	47 (50.5%)
<80 IU/ml	64 (68.8%)	70 (75.3%)	54 (58.1%)
≥80 IU/ml	29 (31.2%)	23 (24.7%)	39 (41.9%)

The result antibody in table 2 in titer antibody with cutoff point ≥30IU/ml was good increased of developing antibody titer 6 months 67% employees have already standard minimal antibody protective and all employee still healthy. On the contrary antibody titer <30IU/ml 33.3% at 6 months was decreased 16.2% employees that have not antibody titer protective and still healthy.

The result antibody in table 2 in titer antibody with cutoff point ≥50IU/ml was good increased of developing antibody titer 6 months 7,5% Ab protective, despite all employees were still healthy. Employees have antibody titer protective amount 50.5%. On the contrary antibody titer <50IU/ml 49.5% at 6 months was decreased 7.5% employees have not antibody titer protective, all employees still healthy.

The result antibody in table 2 in titer antibody with cutoff point ≥80IU/ml was good increased of developing antibody titer 6 months 41.9% employees have already standard minimal antibody protective, was increased titer antibody amount 10.7%, and all employee still healthy. On the contrary antibody titer <80IU/ml 58.1 at 6 months was decreased 10.7% employees that have not antibody titer protective and still healthy.

The final result cut off point 30 IU/ml blood has protective minimal antibody amount 50.5% employees and 6 months still healthy.

Table 3: The Influence Age to Antibody (Ab) 14 Days, 3 Months, 6 Months with Cutoff Point Titer Antibody 30 IU/ml, 50 IU/ml, 80 IU/ml Post Vaccination Sinovac Two Doses of Employee Islamic Hospital Bontang, East Kalimantan

	Age	Ab <30IU/ml	Ab ≥30Iu/ml	P value, OR, 95% CI	Ab <50 IU/ml	Ab ≥50IU/ml	P value, OR, 95% CI	Ab < 80 IU/ml	Ab ≥80IU/ml	P value, OR, 95% CI
14 Days	22-45 Years	5(71.4%)	42(48.8%)	0.435, 0.382 0.070 -2.076	5 (71.4%)	35(40.7%)	0.135 0.275 0.050 -1.496	3 (42.9%0	26 (30.2%)	0.673 0.578 0.121 -2.766
	46-60 years	2 (28.6%)	44 (51.2%		2 (28.6%)	51 (59.3%		4 (57.1%)	60 (69.8%)	
3 months	22-45 Years	6 (85.7%)	43(50%)	0.115, 0.167 0.019 -1.443	3 (42.9%)	29 (33.7%)	0.689 ,0.678 0.970 -1.430	3 (42.9%)	20 (23.3%)	0.358, 0.404 0.083 -1.958
	46-60 years	1 (14.3%)	43 (50%)		4 (57.1%)	57 (66.3%)			66 (76.6%)	
6 months	22-45 Years	6 (85.7%)	56 (65.1%)	0.418 0.311 0.036 -2.706	3 (42.9%)	44 (51.2%)	0.714 1.397 0.295 -6.617	3 (42.9%)	36 (41.9%)	1.000 0.960 0.202 -4.555
	46-60 years	1 (14.3%)	30 (34.9%)		4 (57.1%)	42 (48.8%)		4 (57.1%)	50 (58.1%	

Base on result research table 3 age related with antibody covid19 with cutoff point antibody titer 30Iu/ml, 50IU/ml, 80IU/ml was not significant.

Table 4: The Influence Gender to Antibody (Ab) 14 Days, 3 Months, 6 Months with Cutoff Point Titer Antibody 30 IU/ml, 50 IU/ml, 80 IU/ml Post Vaccination Sinovac Two Doses of Employee Islamic Hospital Bontang, East Kalimantan

	Gender	Ab <30IU/ml	Ab ≥30Iu/ml	P value, OR, 95% CI	Ab <50 IU/ml	Ab ≥50IU/ml	P value, OR, 95% CI	Ab < 80 IU/ml	Ab ≥80IU/ml	P value, OR, 95% CI
14 Days	Male	30(50.8%)	17(50%)	0.937 0.967 0.416 -2.248	25(42.4%)	15(44.1%)	0.870 1.074 0.458 -2.516	19(32.2%)	10(29.43%)	0.780 877 0.300 -2.196
	Female	29(49.2)	17 (50%)		34 (57.6%)	19 (55.9%)		4 (57.1%)	60 (69.8%)	
3 months	Male	36 (61%)	13(38.2%)	0.034 0.396 0.166 -0.941	23 (39%)	9 (26.5%)	0.221 0.563 0.223- 1.420	15 (25.5%)	8 (23.5%)	0.838 0.903 0.33 -2.418
	Female	23 (39%)	21 (61.8%)		36 (61%)	25 (73.5%)		26 (49.2%)	44 (74%)	
6 months	Male	44 (74.6%)	18 (52.9%)	0.033 0.384 0.157 -0.936	34 (57.6%)	13 (38.2%)	0.072 0.455 0.192 -1.079	29(49.2%)	10 (29.4%)	0.063 0.431 0.176 -1.057
	Female	15(25.4%)	16(47.1%)		25 (42.4%)	2 1(61.8%)		4 (57.1%)	24(70.6%)	

Table 5: The Influence BMI (kg/m2) to Antibody (Ab) 14 Days, 3 Months, 6 Months with Cutoff Point Titer Antibody 30 IU/ml, 50 IU/ml, 80 IU/ml Post Vaccination Sinovac Two Doses of Employee Islamic Hospital Bontang, East Kalimantan

	Gender	Ab <30IU/ml	Ab ≥30Iu/ml	P value, OR, 95% CI	Ab <50 IU/ml	Ab ≥50IU/ml	P value, OR, 95% CI	Ab < 80 IU/ml	Ab ≥80IU/ml	P value, OR, 95% CI
14 Days	Normal 18-25	12(36.4%)	35(58.3%)	0.043 2,450 1.021 -5.880	11(33.3%	29(48.3%0	0.162 1.871 0.773 -4.528	7 (21.2%)	22(36.7%)	0.124 2.150 0.80 2-5764
	Up Normal 25.1-36	21 (63.6%)	25(41.7%)		22 (66.7%)	31 (51.7%0		26 (78.8%)	26 (78.8%)	
3 months	Normal 18-25	16(48.5%)	33(55%)	0.547 1.294 0.554 -3.042	11(33.3%)	21(35%))	0.871 1.351 0.491 -3.715	7(21.2%)	15 (25.5%) C	0.560 1.351 0.491 -3.715
	Up Normal 25.1-36	17 (51.5%)	27 (45%)		22(66.7%)	39 (65%		26 (78.8%)	44 (73.3%)	
6 months	Normal 18-25	19 (57.6%)	43 (71.7%)	0.168 1.864 0.765 -4.538	36 (60%)	13 (38.2%)	0.014 3.000 1.233 -7.299	10 (30.3%)	29 (48.3%)	0.092 2.152 0.0876 -5.285
	Up Normal 25.1-36	14 (42.4%)	17 (28.3%)		22 (66.7%)	24 (41%)		23 (69.7%)	31(51.7%)	

Table 5 Result research titer antibody was significant in normal BMI at 3 months and 5 months, while of BMI up normal majority obesities. For BMI normal was good increased antibody titer 14 days until 6 months. All employees at 6 months were still healthy.

Gender	BMI	Ab	Ab.6 months Observed 30IU/ml	P value, OR 95%CI	Ab. 6 months Observed 50IU/ml	P value, OR, 95%CI	Ab 6 months. Observed 80 IU/m	P value, OR, 95%CI
Male	18-25	protect	63.6%	0.033,2.673 1.081-6.610	59.1%	0.064,2.335 0.952-5.729	45.5%	0.061 2.390 0.958 -5.953
		Not protect	36.4%		40.9%		54.5%	
	25.1-36	protect	33.3%	0.158,1.934 0.774-4.836	0.0%	0.014,3.143 1.265-7.809	0.0%	0.088 2.223 0.880 -5.562
		Not protect	66.7%		100%		100.0%	
Female	18-25	protect	76.3%		60.5%		50.0%	
		Not protect	23.7%		39.5%		50.0%	
	25.1-36	protect	71.4%		52.4%		47.6%	
		Not protect	28.6%		47.6%		52.4%	

For six months, Gender, BMI and Ab of cut-off point Ab 30IU/ml; Ab 50 IU/ml, and Ab.80IU/ml the number percentage titre Ab female was highest and significant than male at cut-off 30IU/ml, and on Ab.50 IU/ml and 80 IU/ml was not significant. BMI normal was significant with gender and Ab.50 IU/ml.

Table 6.a: Result Multivariate Analysis BMI and Gender with Ab.14Days, 3 Months, 6 Months and Cut off Point Ab.30IU/ml blood, 50IU/ml, and 80IU/ml.

Ab3month30a		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
	Intercept	.151			
	Gender	**.036**	**2.541**	**1.065**	**6.061**
	[BMI 18-25] kg/m2	.533	1.320	.551	3.160
	[BMI 25.1-36] kg/m2	.	.	.	.

On Table 6.a, Gender, BMI were influenced to the antibody titer three months with cut-off point 30IU/ml after to analysed multivariate only gender was Influenced with p value 0.036, OR 2.541, 95%CI OR 1.065-6.061. BMI was not significant p value 0.533.

Table 6.b: Result Multivariate Analysis BMI and Gender with Ab.14Days, 3 Months, 6 Months and Cut off Point Ab.30IU/ml blood, 50IU/ml, and 80IU/ml.

Ab3month30a		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
	Intercept	.174			
	Gender	.036	2.528	1.062	6.019

Furthermore, on table 6.b, BMI was out on the model, gender p value 0,036, the OR was increased to become OR2.528, 95%CI 1.062-6.019.

Table 6.c: Result Multivariate Analysis BMI and Gender with Ab.14Days, 3 Months, 6 Months and Cut off Point Ab.30IU/ml blood, 50IU/ml, and 80IU/ml.

Ab3month30a		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
	Intercept	.504			
	Gender	.033	2.673	1.081	6.610
	[BMI 18-25] kg/m2	.158	1.934	.774	4.836
	[BMI 25.1-36] kg/m2	.	.	.	.

On Table 6.c at Six Months later gender again was influenced with antibody cut off point 30IU/ml, and nutrition status (BMI) was not influence to 6 months antibody titer.

Table 6.d: Result Multivariate Analysis BMI and Gender with Ab.14Days, 3 Months, 6 Months and Cut off Point Ab.30IU/ml blood, 50IU/ml, and 80IU/ml.

Ab3month30a		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
	Intercept	.732			
	Gender	.035	2.607	1.068	6.367

On Table 6.c at Six Months final model gender again was influenced with antibody cut off point 30IU/ml p value 0.035, Odd Ratio 2.607, 95% CI 1.068-6.367. Male was significant in six months and has chance Ab. protective twice more comparing with female, while in 14 days, 3 months with titre 50 IU/ml and 80 IU/ml have not significant at Table 5 and 6 d.

Discussion

Age was nor influence with antibody titer on days14, three months, six months with cutoff point 30IU/ml, 50IU/ml and 80 IU/ml because almost all the employee adult (22-45years) amount 92.5%, and 46-60 year amount 7.5%. Age that correlation with this research is in line with that conducted by [5]. It can be seen that there was no significant relationship between age and the formation of antibody titers with p value 0.156. In this study, samples were taken 4 weeks after the 2nd dose of vaccine with an inactive vaccine with an age range of 20-65 years [6]. Research divided the ages under 80 years and over 80 years, the results Individuals over 80 years of age differ from the younger group in four main ways that can explain the more neutralization of SARS-CoV-2 bad, but this research is the oldest and is still of productive age. First, serum IgG levels are lower, accompanied by a lower proportion of IgG+ IgM− CD19+ specific memory B cells. Second, parents show lower somatic hypermutation in the BCR gene. Third, parents had lower attainment for the BCR clone associated with neutralization. And fourth, the older group showed a marked decrease in IL-2-producing spike-reactive CD4+ T cells. According to showed a negative relationship

between age and the formation of antibody titers [7]. Where the age is under 30 years with the formation of a mean IgG of 100.4 AU/ml with (CI 51.8-194.5), then for ages 30-39 years the mean IgG is 84.2 with (CI 74.3-95.3), for ages 40-49 years the mean IgG is 68.2 (CI 60.2-77.4), ages 50-59 have an IgG mean of 61.5 (CI 52.6-71.9) and ages 60 and over IgG his 49.8 (CI 42.6-58.1). So that it looks the older the smaller the formation of antibody titers [8]. Showed the results of the End-Point Titer on the Receptor-Binding Domain ELISA on day 209 or for 6 months which were highest at ages 18 – 55 years, then 56 – 70 years and the lowest at the age of 70 years. The age factor that affects antibodies is also shown by where researchers divide age into two categories, namely under 60 years and over 80 years [9]. After taking the sample on the 17th day after administration of the 2nd dose of vaccine, it showed a significant difference between the ages of under 60 years and those over 80 years with a mean antibody titer of 3702 BAU/ml with a range of 81.6 – 32000 BAU/ml with all participants not antibody titers were found below the cut-off. Whereas at the age of over 80 years the mean antibody titer was 1332 BAU/ml with a range of 0 – 16891 BAU/ml, with 10.6% of participants at this age having antibody titers below the cut-off [10]. Researching the effectiveness of the H1N1 Influenza vaccine found results where the adult group was significantly lower than the children group (p value 0.01). Age of children from under 8 years to 17 years, while in adults from 17 years to over 64 years. This study also strengthens the research that the researchers conducted that in the adult to old age range there was no significant difference with a p value of 0.95 [11]. Study showed that the age group 18-55 years had a GMT of 232.9 on day 43 with a vaccine dose of 10 µg and 254.0 at a dose of 30 µg. while the age group 65-80 years had a GMT of 80 at a dose of 10 µg and 160.0 at a dose of 30 µg.

Age was not affected with antibody titer on days 14, three months, six months with a cutoff point of 30IU/ml, 50IU/ml and 80 IU/ml because almost all the employee adults (22-45 years). This research is in line with that conducted by [5]. It can be seen that there is no significant relationship between age and the formation of antibody titer with p 0.156. In this study, samples were taken 4 weeks after the 2nd dose of vaccine with an inactive vaccine with an age range of 20-65 years [6]. Research divided the ages under 80 years and over 80 years, the results Individuals over 80 years of age differ from the younger group in four main ways that can explain the more neutralization of SARS-CoV-2 bad, but this research is the oldest and is still of productive age. First, serum IgG levels are lower, accompanied by a lower proportion of IgG+ IgM− CD19+ specific memory B cells. Second, parents show lower somatic hypermutation in the BCR gene. Third, parents had lower attainment for the BCR clone associated with neutralization. And fourth, the older group showed a marked decrease in IL-2-producing spike-reactive CD4+ T cells. According to Ja showed a negative relationship between age and the formation of antibody titer [7]. Where the age is under 30 years with the formation of a mean IgG of 100.4 AU/ml with (CI 51.8-194.5), then for ages 30-39 years the mean IgG is 84.2 with (CI 74.3-95.3), for ages 40-49 years the mean IgG is 68.2 (CI 60.2-77.4), ages 50-59 have an IgG mean of 61.5 (CI 52.6-71.9) and ages 60 and over IgG his 49.8 (CI 42.6-58.1). So that it looks the older the smaller the formation of antibody titer [8]. Showed the results of the End-Point Titer on the Receptor-Binding Domain ELISA on day 209 or for 6 months which were highest at ages 18 – 55 years, then 56 – 70 years and the lowest at the age of 70 years. The age factor that affects antibodies is also shown by [9] where researchers divide age into two categories, namely under 60 years and over 80 years. After taking the sample on the 17th day after administration of the 2nd dose of vaccine, it showed a significant difference between the ages of under 60 years and those over 80 years with a mean antibody titer of 3702 BAU/ml with a range of 81.6 – 32000 BAU/ml with all participants not antibody titer were found below the cut-off. Whereas at the age of over 80 years the mean antibody titer was 1332 BAU/ml with a range of 0 – 16891 BAU/ml, with 10.6% of participants at this age having antibody titer below the cut-off. (Cao et al., 2021)researching the effectiveness of the H1N1 Influenza vaccine found results where the adult group was significantly lower than the children group (p value 0.01). Age of children from under 8 years to 17 years, while in adults from 17 years to over 64 years. This study also strengthens the research that the researchers conducted that in the adult to old age range there was no significant difference with a p value of 0.95 [11]. Their study showed that the age group 18-55 years had a GMT of 232.9 on day 43 with a vaccine dose of 10 µg and 254.0 at a dose of 30 µg. while the age group 65-80 years had a GMT of 80 at a dose of 10 µg and 160.0 at a dose of 30 IU/ml. More about Age was nor influence with antibody titer on days14, three months, six months with cutoff point 30IU/ml, 50IU/ml and 80 IU/m

Gender in this research with cutoff point antibody titer 30IU/ml, 50IU/ml, 80IU/ml pos vaccination Covid19 two doses, 14 days have not significant because male and female have not difference proportion protective antibody cut-off 30 IU/ml. Gender was significant only 3 months and 6 months, noted for 3 months female was good antibody titer protective 61.8%, while in 6 months male has antibody titer protective 52.9%. Significant decrease and increase in protective antibody levels in women and men. Others antibody titer have not significant of gender. Gender in this research with cut-off point antibody titre 30IU/ml, 50IU/ml, 80IU/ml post vaccination Covid19 two doses, was significant only 3 months and 6 months, noted for 3 months female was good antibody titre protective 61.8% while in 6 months male has a protective antibody titre of 52.9%. Significant decrease and increase in protective antibody levels in women and men. Other antibody titre has not significant of gender. Gender is a biological variable that influences the immune response to self-antigens and foreign antigens (for example, those from fungi, viruses, bacteria, parasites, and allergens). The sex of an individual is determined by the differential organization of chromosomes, reproductive organs, and sex steroid levels; it is different from gender, which includes the behaviours and activities dictated by society or culture in humans. Male and female differences in immunological responses can be influenced by sex and gender, with sex contributing to physiological and anatomical differences that affect exposure, recognition, clearance, and even transmission of microorganisms [12]. This is reinforced by research conducted by [12] which states that the antibody response to bacterial and viral vaccines is often higher in women than men. The research conducted by [13] shows that from

the formation of antibodies the average formation is 93.65 in women and 90.7 in men from the age range of 18 to 59 years. On serological tests observed at 6 months, females appear to be slightly taller than males. [14, 5] studied health workers with a sample of 180 women and 133 men, showing a p value 0.111, which means there is no significant relationship between gender and the formation of antibody titre. In an article conducted by [12] Men and women are biologically different and this seems to contribute to the results of specific vaccines according to sex. Among children, adults in their reproductive years and the elderly, women have a higher antibody response than men. This was also reinforced by research conducted [7] which showed the mean IgG value for women was 75.9 AU/ml (CI 65.6 – 87.9) while for men the value was the mean IgG was lower, namely 64.6 UA/ml with a CI of 60.2 – 69.2).

BMI in this study was significant in normal BMI at 3 months and 5 months, while BMI was up to the normal majority of obesity. For normal BMI was good increased antibody titre 14 days to 6 months, although in the multivariate analysis was not affected by the improved Ab Covid19. BMI in this research is normal 18-25.1 and up, normal for the majority of obesity is 25.1-36 kg/m2. BMI was out on the model after controlling with gender in three months and at six months later, gender was again influenced by the antibody cut off point of 30IU/ml. This is consistent with a study conducted by [16] which stated that a high BMI is associated with lower anti-SAR-CoV-2 spike IgG antibody titre in males, but not in females. Men with BMI < 18.5 had geometric mean titre (GMT) 6.093 (95% CI 4.874 – 7.618 AU/ml) and 4.874 men with BMI ± 30 had GMT 4.655 AU/ml (95% CI = 3.795 – 5.708 AU/ml) with a p value of 0.004. Meanwhile, women with BMI < 18.5 had a GMT 6.171 AU/ml (95% CI 5.714 – 6.665 AU/ml) and women with a BMI ≥ 30 had a GMT 5.506 AU.ml (95% CI 4.404 – 6.883 AU /ml) with a p-value of 0.97. In the study [5] it also showed a p value of 0.316, which means that BMI does not have a significant relationship either. The study divided BMI into 3 categories, namely normal (19 – 24.9 Kg/m2), over weight (25 – 29.9 Kg/m2) and obese (≥30 Kg/m2). Another study conducted by (Painter et al., 2015), in a study conducted on the administration of influenza A virus, hepatitis B virus, tetanus and rabies vaccines, showed that in obesity, poor antibodies would be formed. In children with Tetanus (8 – 17 years) with BMI (29.1±1.6) have specific-Tetanus IgG (2.6±0.6 IU/ml), whereas in children with the same age with BMI (18, 4±0.7) has specific-Tetanus IgG (4.2±0.5 IU/ml), p value 0.05. In the Hepatitis B Virus (HBV) vaccine, all respondents with BMI (25 – 35) had a protective anti-HBs titre (>10 mI U/m for HBV) and respondents with a BMI > 35 had an anti-HBs titre ≤ 10 mIU/ml 61 .5 %, while 45 % had an undetected anti-Hbs titre (≤ 2 mIU/ml) (p value 0.05). More about BMI in this research was significant in normal BMI at 3 months and 5 months, while of BMI up normal majority obesities. For BMI normal was good increased antibody titer 14 days until 6 months, despite in the multivariate analysis was not influenced with the improved Ab Covid19. BMI in this research normal 18-25, 1 and up normal majority obesities 25.1-36 kg/m2. BMI was out on the model after control with gender in three months and at six months later, gender again was influenced with antibody cut off point 30IU/ml [17-19].

Conclusion

There was an increase in antibody titre on the 14th day, 3 months and 6 months after administration of the 2nd dose of vaccine, with the following mean: 80.98, 108.48 and 682.43. This means that there is an increase on the 14th day to 3 months 1.3 times, 3 months to 6 months there is an increase of 6.3 times and on the 14th day with 6 months there is an increase of 8.4 times. It turned out that after giving the 2nd dose of vaccine for 6 months, the antibody titre was still increasing. According to [14] the decline occurred after 6 months.

There is an effect of gender on the formation of antibody titre on the 14th day, 3 months and 6 months after administration of the 2nd dose of vaccine. Where women have higher antibody titre than men.

There is no effect of age on the formation of antibody titre on the 14th day, 3 months and 6 months after administration of the 2nd dose of vaccine, in the age range of 18-59 years.

There is an effect of BMI on the formation of antibody titre on the 14th day, 3 months and 6 months after administration of the 2nd dose of vaccine. The fatter a person is, the lower the formation of antibody titre. Six months, BMI normal and Gender together influenced Ab cut-off 50IUml, female was good increased Ab titre than Male.

The most dominant variable in the formation of antibodies is gender, male good improved Ab days 14, and Female 6 moths was good increased Ab.

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