Bionatura
Latin American Journal of Biotechnology and Life Sciences

Bionatura Issue 4 Vol 8 No 1 2023

Article

A comparative study between COVID-19 vaccine (Pfizer and Sinopharm) and their relationship to some cytokines

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Available from: http://dx.doi.org/10.21931/RB/CSS/2023.08.04.26

ABSTRACT

The research was carried out in Babylon Governorate between 12/10/2021 and 27/12/2022 on 85 vaccinated individuals with or without prior infection as a test group, in comparison to 35 individuals recovering from COVID-19, which was mentioned as a positive (+ve) control, and with 30 individuals from a healthy population (non-infected with Covid-19), as a negative (-ve) control groups. Various parameters were studied to evaluate immunological status. The research aimed to evaluate the immune aspects of people vaccinated with the coronavirus vaccine. The study revealed statistically significant variations in the vaccine efficiency for the two investigated vaccinations between the periods following vaccination. Besides, the Pfizer vaccine induces more protection than Cinopharm at the cellular and humeral immune reactivity.

Keywords: Vaccine; Cinopharm; Pfizer; Cytokines.

INTRODUCTION

The emergence and spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused a pandemic with over 3.8 million deaths1 and rapid development of multiple vaccine candidates[1]. The SARS-CoV-2 infection elicits antibodies against spike protein (S) and nucleoprotein (N) [2, 3]. Based on virus challenge studies in animals, the spike protein-specific antibodies are neutralizing and associated with protective immunity [1, 4]. Although the persistence of vaccine-induced antibodies is still not known, infection-induced neutralizing antibodies have remained detectable for at least six months after symptom onset [5].

Antibody tests, which use lateral flow assays to identify antigens (spike, membrane, or nucleocapsid proteins) or antibodies for COVID-19, are a quick way to find out [6]. Rapid diagnostic tests (RDT), enzyme-linked immunosorbent assays (ELISA), neutralization assays, and chemiluminescent immunoassays are the four main types of antibody testing [7]. According to current World Health Organization standards, a blood sample should be taken during the first week of sickness and then again three to four weeks later to test for SARS-CoV-2 antibodies [8].

In COVID-19 patients, the IgM positive rate climbed from 50% to 81 percent within 5 days of infection, while the IgG positive rate went from 81 percent to 100%. 13 Unlike nasopharyngeal RT-PCR studies, antibody tests allow for improved epidemiological data collecting, evaluation of asymptomatic people' immunological state, and screening for past exposure [6]. The key point in SARS-CoV-2 infection could be the depletion of antiviral defenses related to innate immune response as well as an elevated production of inflammatory cytokines. Individuals with comorbidities are likelier to have an "inappropriate and inadequate immune response." As a result, this might encourage viral replication and exacerbate difficulties associated with severe illness cases) The depletion of antiviral defenses associated with the innate immune response, as well as an increased generation of inflammatory cytokines, maybe the critical point in SARS-CoV-2 infection[9].

MATERIAL AND METHOD

The duration of sampling in the study was during the period from 11/11/2021 to 29/1/2022 on people vaccinated with the corona vaccine in all areas of Babylon government with two doses at different intervals after giving the vaccine ranging from(2 W - 1Mom, 2 Mon - 3 Mon, 4 Mon - 5 Mon, > 5Mon)and were also collected from unvaccinated people as control include (Healthy and Cured). Five ml of venous blood was obtained from each participant.

The blood was placed in a gel tube and let to stand for 30 minutes, and then samples were centrifuged (3000rpm / 15 min). The serum collected was divided into 3 Eppendorf (200 ml each) and kept in the freezer (-20 c) until it was used for the laboratory assays. The VIDAS SARS –COV-2IgG is an automated assay using the ELFA Enzyme Linked Fluorescent Assay technique intended for qualitative detection of IgG antibodies to SARS-Cov-2 in human serum or plasma lithium heparin on instruments of the VIDAS family. The immunosorbent assay linked to the enzyme ELISA test known as IL-15, IL-12 and IFN-ϒ in the serum was tested.

RESULTS

The relationship between types of vaccine and cytokines level of the studied population.

The relation was introduced to reach the anti-Sars –IgG antibody level, which revealed a higher level than the cinopharm vaccine, as in Table (3 -1). The cytokines level of the vaccinated population with the Pfizer vaccine in two related doses shows higher levels than the cinopharm vaccine. The highest level was recorded of (IL-12, IL-15 and INF - γ) in the Pfizer vaccinated population as well as control, as shown in Table (3-2).

Antibodies	Studi-Groups	Vaccine Types	N	Mean	SD	LSD
Anti Sars - Coc2 IgM	(Vaccinated)	Pfizer Vac	**45**	**0.08**	**0.14**	.006
		Sinopharm Vac	**40**	**0.03**	**0.03**	
	Control (+ve & –ve)	Con-trol(Non-Vac)	**65**	**0.14**	**0.22**	.006
Anti Sars - Coc2 IgG	(Vaccinated)	Pfizer Vac	**45**	**41.70**	**11.58**	<0.001
		Sinopharm Vac	**40**	**23.66**	**15.10**	
	Control (+ve & –ve)	Control(Non-Vac)	65	20.87	13.80	<0.001

Table 1. The relationship between types of vaccine and Antibodies(IgM and IgG) level of Studied population.

Cytokines	Studied Groups	Vaccine Types	N	Mean	SD	LSD
IL -12	(Vaccinated)	Pfizer	45	36.15	4.52	<0.001
		Sinopharm	40	15.10	2.09	
	Control (+ve & –ve)	Control (Non -Vac)	65	6.0240	0.92	<0.001
IL -15	(Vaccinated)	Pfizer	45	693.33	59.90	<0.001
		Sinopharm	40	488.28	43.52	
	Control (+ve & –ve)	Control (Non -Vac)	65	293.73	37.73	<0.001
IL –γ	(Vaccinated)	Pfizer	45	181.11	171.91	<0.001
		Sinopharm	40	100.74	98.48	
	Control (+ve & –ve)	Control (Non-Vac)	65	54.83	12.31	<0.001

Table 2. The relationship between types of vaccine and cytokines level of the Studied population.

The study showed statistically significant differences in the vaccine effectiveness between the periods after taking the vaccine for the two studied vaccines at the P value level (.001>), as listed in Table 3.

Cross tabulation			Time after Vaccination				Total	Chi-Square P.Value
			2 W - 1 M	2 - 3M	4 - 5 M	>5 M		
Vac Type	Faizer Vac	Count	8	28	8	1	45	8.521
		% of Total	9.4%	32.9%	9.4%	1.2%	52.9%	<0.001
	Sinopharm Vac	Count	4	16	18	2	40	
		% of Total	4.7%	18.8%	21.2%	2.4%	47.1%	
Total		Count	12	44	26	3	85	
		% of Total	14.1%	51.8%	30.6%	3.5%	100.0 %	

Table 3. The type of vaccine sensitivity with the time after vaccination

The Correlation between anti-Sars-Cov2 IgM and IgG antibodies among studied groups.

Although the IgG is more than IgM, there was a direct correlation between IgM and IgG antibodies against the Sars-Cov 2 virus among the Vaccinated, curried and healthy population.

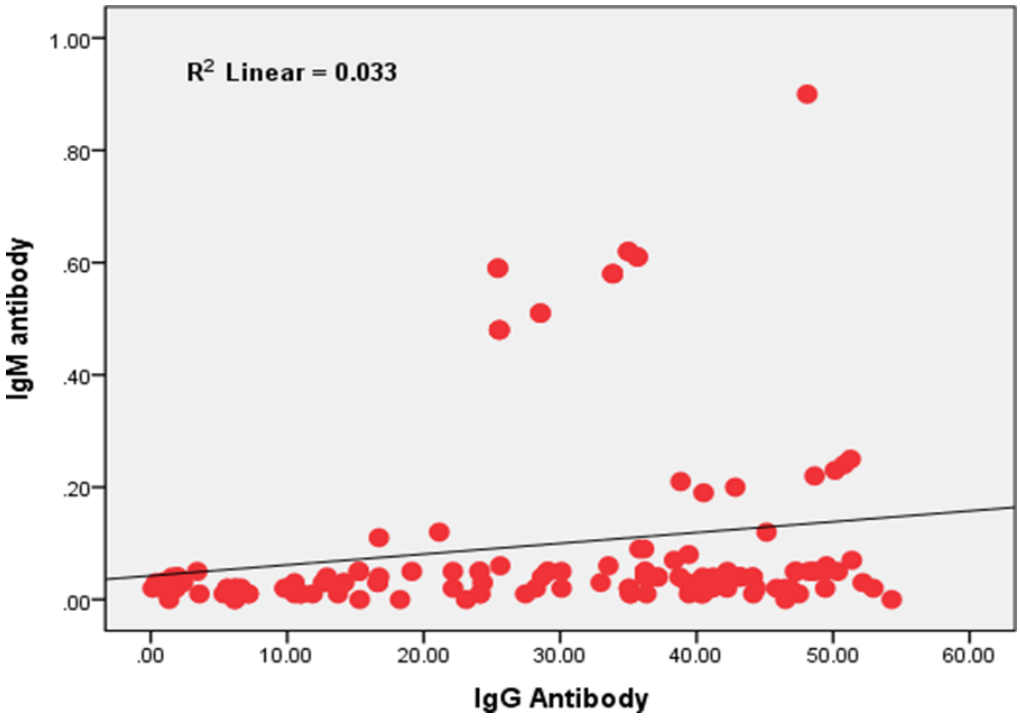

Figure 1. The Correlation between anti-Sars-Cov2 IgM and IgG antibodies among studied groups(vaccinated).

DISCUSSION

In general, natural infection creates a protective immunity against reinfection. However, in the 62 COVID-19 patients, reinfection is possible, whereas the definitive antibody level for protective immunity remains inconclusive [10; 11]. Recent evidence suggests that a high neutralizing titer 64 may be required for protection against the circulating SAR-CoV-2 variants of concern (VOCs) infection and symptomatic disease [12].

The result might show that the Pfizer vaccine induces more protection than Cinopharm at the cellular and humeral immune reactivity. China's inactivated vaccines initially generate lower levels of 'neutralizing' or virus-blocking antibodies — considered a proxy for protection — and these levels drop quickly over time. One study from Hong Kong [13], which has not been peer-reviewed, showed that CoronaVac induces a significantly lower antibody response compared with Pfizer–BioNTech's mRNA jab one month after two doses but that the T-cell response was comparable. Another non-peer-reviewed study in China also found that B cells and T cells specific for SARS-CoV-2 could be detected five months after two doses of the Sinopharm vaccine [14].

It was shown that the decline in vaccine efficacy or effectiveness against severe COVID-19 disease with timelines vaccination was less than that for SARS-CoV-2 infection and symptomatic COVID-19 disease, and the average change in vaccine efficacy or effectiveness over time was estimated using a linear mixed-effects model for the repeated measures within each study vaccine group A decrease in the vaccine efficacy or effectiveness over time has three potential explanations the decrease reflects lower vaccine efficacy or effectiveness against a new variant proper waning immunity caused by loss of vaccine-induced immunological protection or bias [15]. It has been shown that with increasing time since complete vaccination, the viral load of breakthrough infections increases but becomes lower again soon after booster vaccination [16]. The two-dose COVID-19 vaccination campaign substantially reduced hospitalizations and deaths despite high infection rates [17]. However, the effectiveness against infection, as happens also for other vaccines, wanes within months of the second dose [18, 19].

CONCLUSION

The two-dose COVID-19 vaccination campaign substantially reduced hospitalizations and deaths despite high infection rates. In comparison, the Pfizer vaccine induces more protection than Cinopharm at the cellular and humeral immune reactivity. However, the study revealed statistically significant variations in the vaccine efficiency for the two investigated vaccinations between the periods following vaccination. Besides

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Received: May 15, 2023/ Accepted: June 10, 2023 / Published: June 15, 2023
Citation: Tuama, BS; Al-Rubaye, AFM, Merza, A. A comparative study between COVID-19 vaccine (Pfizer and Sinopharm) and their relationship to some cytokines. Revista Bionatura 2023;8 (2) 63. http://dx.doi.org/10.21931/RB/CSS/2023.08.04.26