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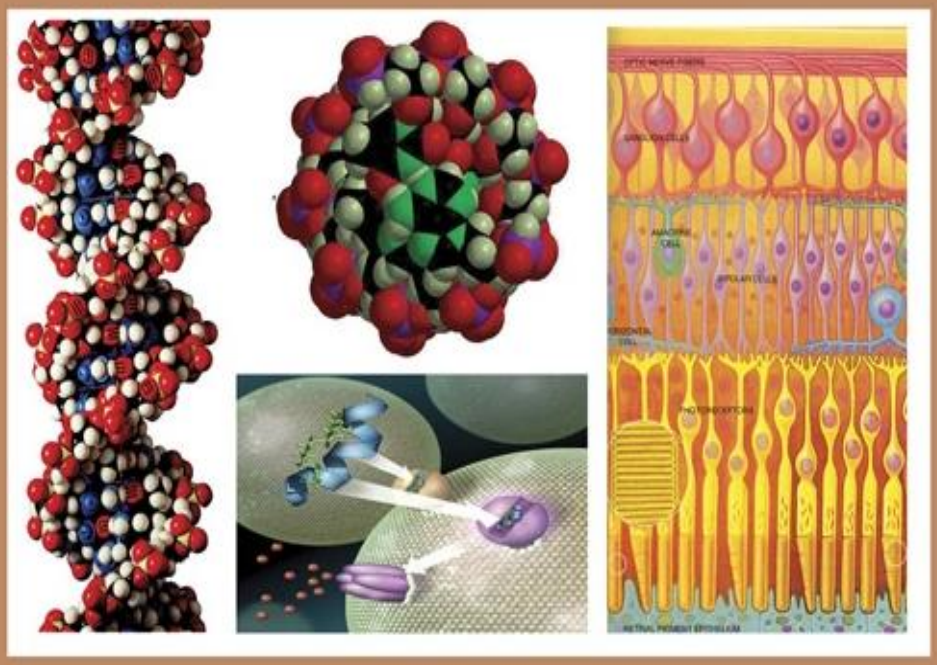

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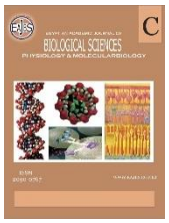

Biochemical Study for The Effect of Sinopharm COVID-19 Vaccine

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ABSTRACT

The current study included the biochemical evaluation of the effect of the COVID-19 vaccine (Sinopharm) among vaccinated individuals. The study included (90) blood samples of thirty people (each person has three samples) who received the Sinopharm vaccine, their ages ranged between (18-55) years and for both sexes, and the samples were divided into three groups; represented by a sample before the vaccine, a sample after receiving the first dose, and a sample after receiving the second dose of the vaccine. Samples were collected from the vaccine center in Al-Dhuluiya general hospital-Salah Al-Din who was vaccinated with the Sinopharm vaccine during the period from 1/11/2021 until 1/2/2022.

Our study evaluated the level of some biochemical parameters, including- Lactate dehydrogenase-LDH activity, Troponin, D-dimer, Lipid profiles(Cholesterol, Triglycerides, Low-density lipoprotein cholesterol-LDL-C, High-density lipoprotein cholesterol-HDL-C), Total iron-TI, Transferrin, Ferritin, Total iron binding capacity-TIBC, Transferrin saturation, Malondialdhyde-MDA, Glutathione-GSH and peroxy nitrate.

The results showed that LDH, Troponin, GSH and MDA levels were significantly elevated and the total iron, Transferrin, Total iron binding capacity-TIBC, and Transferrin saturation were significantly decreased after the first and second doses of the Sinopharm vaccine as compared with their levels before receiving doses vaccine. While the level of D-dimer, lipid profile, Ferritin and peroxy nitrate didn't show any significant difference after vaccination as compared with their levels before receiving the vaccine. So we can conclude that the vaccination with the Sinopharm COVID-19 vaccine may affect the cardiac marker, iron state and oxidative stress state.

INTRODUCTION

The COVID-19 virus is one of the most active and most dangerous known viruses in terms of the speed of spread and its impact on human life. It is also one of the coronaviruses that infect humans, which was known by this name because it takes a corona-like shape. It is a type of RNA virus that infects the Respiratory, digestive and urinary systems of humans and birds (Al-Jameel & Al-Mahmood., 2020). The virus first appeared in the Chinese city of Wuhan in December 2019, as an acute lung disease, and the virus was called Severe Acute Respiratory Syndrome Coronavirus 2 - SARS-CoV-2(Shereen *et al*., 2020). On March 11, 2020, is declared it a global pandemic (Velavan & Meyer., 2020).

The clinical symptoms of the COVID-19 virus varied, ranging from mild to severe respiratory diseases and sometimes leading to death as a result of respiratory failure (Phan., 2020). The virus can cause mild symptoms including fever, shortness of breath, cough, tiredness, and malaise. These symptoms may progress to pneumonia, respiratory failure-RF, and sometimes death (Kooraki *et al*., 2020).

Therefore, the attention of researchers around the world was directed to finding an effective vaccine that protects against infection with this virus. Virus vaccines must be immunogenic, sufficiently stable, safe, and suitable to induce long-term immunity (Ada., 2003). There are many types of vaccines, including live attenuated vaccines, killed or inactivated vaccines, inactivated toxoids, subunit and conjugate vaccines, mRNA vaccines, and viral vector vaccines (Plotkin, and Orenstein., 2007). Each of these types has certain advantages and limitations, however, it may cause some side effects and be less effective compared to other viral vaccines (Enjuanes *et al*., 2016). For example, in the COVID-19 virus vaccine, local and systemic side effects are relatively common, especially after the second dose, as most symptoms are of mild or moderate severity (Chapin-Bardales *et al*., 2020). Injection site reactions (mainly pain, redness, itching, and swelling) occur in about 65%, fatigue, headache, and muscle pain occur in about (40-50%), and fever, chills, and joint pain occur in about 20%. As for the adverse effects of the vaccine, no serious symptoms appeared, but some symptoms appeared in patients with A very small category is myocarditis and pericarditis, especially in male adolescents and young adults (Frenck *et al.,* 2021). So many people all over the world have anxiety about the side effect of vaccines. Thus, the present study was conducted to evaluate the side effects of Sinopharm vaccine.

MATERIALS AND METHODS

Subjects and study design: Ninety vaccinated plasma and serum samples were collected at the Vaccination Center in Al-Duluiya General Hospital - Salah Al-Din, which were vaccinated with Sinopharm vaccine approved by the Iraqi Ministry of Health during the study period. The period is from 1/11/2021 to 1/2/2022, and the ages range between 18-55 years. Samples were collected before receiving the first dose of the vaccine and 24-48 hours after the first and second doses. The collected samples were divided into three groups:

-First group-G1: - Before taking the first dose of the Sinopharm vaccine.

-Second group-G2: - After taking the first dose of the Sinopharm vaccine.

-Third group-G3: - After taking the second dose of the Sinopharm vaccine.

The study includes the determination of plasma D-dimer concentration(Kaplan & Pesce., 1989) and serum Troponin(McNeil.,2007), Lactate dehydrogenase-LDH activity(Vassiault., 1986), Lipid profiles (Triglycerides, Cholesterol, High-density lipoprotein cholesterol-HDL-C, Low density lipoprotein cholesterol-LDL-C), Transferrin, Total iron-TI(Garcie., 1979), ferritin(Worwood., 1986), Total iron binding capacity-TIBC(Henry., 1984),Transferrin saturation, Malondialdhyde-MDA(Sedlak & Lindsay., 1986), peroxy nitrate-PON(Abi., 1974). and Glutathione-GSH (Sedlak & Lindsay., 1986) concentration by using standard methods.

Statistical Analysis:

The results were analyzed by using SPSS V.25 using the completely randomized design method through the Duncan test for identifying the variance between groups under investigation at probability $p \leq 0.05$.

RESULTS

Levels of Plasma D-dimer and Serum Cardiac Indicator:

The results of D-dimer, LDH and troponin obtained from the current study were summarized in Table 1.

Table 1 showed that the Troponin levels and activity of LDH significantly

elevated at probability p≤0.05 in G1 and G2 after taking the vaccine as compared with the group before taking vaccine G1, with no significant difference in D-dimer before and after vaccination.

Table 1: Mean±Standard deviation of the level of Troponin, D-dimer and LDH activity before and after taking vaccine.

Parameters	**G1**	**G2**	**G3**
D-dimer (mg/dl)	172.93±136.332 a	205.86±72.666 a	213.04±129.044a
LDH (U/L)	312.13±54.858 b	360.70±89.554 a	356.46±82.902 a
Troponin (ng/ml)	0.017±0.008 b	0.027±0.018 a	0.029±0.018 a

Levels of Serum Lipid Profiles:

The study also includes an evaluation of the serum levels of Lipid profiles (Triglycerides, Cholesterol, HDL-C, LDL-C) in sera of samples under investigation before and after taking of vaccine, the results obtained from the current study were summarized in Table 2.

No significant difference in the level of Triglycerides, Cholesterol, HDL-C and LDL-C at probability p≤0.05 was shown in Table 2 between groups after vaccination as compared with G1 before taking the Sinopharm vaccine.

Table 2: Mean±Standard deviation of serum Lipid profiles (Triglycerides, Cholesterol, HDL-C, LDL-C) level before and after taking the vaccine

Parameters	**G1**	**G2**	**G3**
Triglycerides(mg/dl)	189.47±101.592 a	167.43±95.746 a	163.50±90.449 a
Cholesterol (mg/dl)	152.97±38.400 a	141.27±34.372 a	137.00±38.460 a
HDL-C(mg/dl)	41.47±8.191 a	40.43±6.447 a	40.88±7.090 a
LDL-C(mg/dl)	69.70±28.847 a	72.10±28.067 a	64.15±27.968 a

Levels of serum iron indicator

level of Total iron, Transferrin, Total iron binding capacity-TIBC, and Transferrin saturation was significantly decreased in G3 and G2 as compared with its level in G1, with no significant difference in the levels of Ferritin after taking 1st and 2nd dose of the vaccine as compared with their levels before taking the vaccine, Table 3.

Table 3: Mean±Standard deviation of Transferrin, Total iron, Ferritin, Total iron binding capacity-TIBC, Transferrin saturation levels before and after taking vaccine

Parameters	**G1**	**G2**	**G3**
Transferrin (µg/dl)	365.97±43.580 a	336.63±37.970 b	322.85±40.323 b
Total iron (µg/dl)	113.93±40.646 a	74.62±30.863 b	69.77±23.169 b
Ferritin (µg/dl)	24.97±15.582 a	26.23±13.599 a	25.88±15.693 a
TIBC (µg/dl)	516.03±62.825a	475.50±54.266 b	464.54±49.250 b
Transferrin saturation(٪)	22.53±0.092 a	17.00±0.076 b	15.46±0.054 b

Levels of Antioxidant Parameters in Serum:

The study also evaluates the oxidative stress state after administration of vaccine doses, the results showed that the level of glutathione significantly decreased after taking the doses of Sinopharm vaccine with elevated the level of MDA as compared with the group before taking the vaccine, while the level of peroxynitrite no significant difference (non-significant increased) in groups taking the first and second dose of vaccine as shown in Table 4.

Table 4: Mean±Standard deviation of MD, GSH and PON levels before and after taking the vaccine

Parameters	G1	G2	G3
GSH (mole/L)	3.543±1.4185 a	2.787±1.4809 b	2.692±1.2989 b
MDA (mole/L)	38.90±19.814 b	53.13±32.366 a	55.69±28.526 a
PON (mole/L)	88.26±50.293 a	113.04±65.399 a	111.92±68.480 a

DISCUSSION

The results of the current study showed that the level of troponin significantly elevated in the sera of individuals who take the Sinopharm vaccine, Previous studies did not refer to a study of the effect of the Sinopharm vaccine on the level of troponin, but (Zibaeenezhad *et al.*, 2022) indicated an increase in the level of troponin after the first dose of this vaccine for a study of the type of case report. The increase in LDH activity in the present study may be a marker for myocarditis, agreeing with the finding of (Fatima *et al*., 2022) who indicated that the enzyme activity increased in vaccine recipients, whether it was Pfizer, Sinopharm, Moderna, or others, as well as among people infected with the COVID-19 virus compared to healthy people. While the level of D-dimer didn't show any significant difference after receiving the Sinopharm vaccine.

This study also included the evaluation of lipid profiles, which did not show significant differences after receiving both doses of Sinopharm vaccine compared to the levels before receiving the vaccine, so the results of our study also agree with the results of many studies, including (Sahni *et al.*, 2021; Davido *et al.*, 2021), which indicated that COVID-19 virus vaccines are safe and did not record a significant effect on the level of lipids.

The results of the Sinopharm vaccine showed a significant decrease in the level of total iron, transferrin, saturated transferrin and TIBC after receiving the vaccine, so the results of this study also agree with the results of many studies including(Ogun & Adeyinka., 2021; Litton & Lim., 2019), which indicated that receiving a dose of Sinopharm vaccine may cause a significant decrease in the level of iron, and this decrease may cause an imbalance in some cellular and physiological functions of the body. It may also cause an effect on the cellular response of immune cells and lead to anemia, which may cause iron deposition in tissues, while ferritin did not show significant differences compared to the levels before receiving the vaccine. While the level of ferritin didn't show any significant difference after receiving the Sinopharm vaccine. The elevated level of MDA with reducing in the level of antioxidants represent in GSH in the present study indicates that vaccinations under oxidative stress, in which the antioxidants in the cells such as glutathione improve the immune system and prevent the oxidative processes in the body by removing the toxic materials in the cells such as free radicals or peroxides (Fatima *et al.*, 2022), While the level of peroxy nitrate didn't show any significant difference after receiving the Sinopharm vaccine.

Conclusion:

From the results of the present study, we can conclude that the Sinopharm vaccine may have some side effects on the cardiac, iron state and oxidative stress state.

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