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## **Estimation of the levels of vitamin D3 and interleukin 10 in the serum of people recovering from corona virus in Nineveh Governate**

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**Abstract**--The research included an estimation of some biochemical parameters such as Interleukin10, Vitamin D3, A c-reactive protein, Alkaline phosphatase, Iron, Calcium, Phosphorus, in serum of patients with corona virus in comaperation with control group, vaccinated recovering group, unvaccinated recovering group, were diagnosed by specialized doctors at Alfya Lab in Mousl. The samples were (30) control unvaccinated, (23) control vaccinated, (25) recovering unvaccinated, (25) vaccinated recovering, (7) Patients of virus corona of the same age. The results showed a significant increase in the levels of Interleukin10, A c-reactive protein, Alkaline phosphatase. In serum of Patients of virus corona and vaccinated recovering group in compared with Control, unvaccinated groups. Where the levels of iron, calcium, Vitamin D3 shwed a significant decrease in serum of patients with corona virus in comaperation with other groups. The results also clarified a positive correlation between Interleukin 10 and iron, calcium and a negative correlation with Vitamin D3 , Phosphorus , A c-reactive protein and Alkaline phosphatase. The results also showed that there was a significant increase in the levels of Interleukin10, A c-reactive protein, Alkaline phosphatase and significant decrease in the levels of iron, calcium Vitamin D3 in serum of female group in comaperation with male group. The resultes also showed that the female with the age of (50-70) years were more affacted with the severity of the disease. This study was conducted during the period from September 2021 to Novmber 2021.

**Keywords**---coronavirus, Interleukin 10, Vitamin D3, phosphorus, Iron, Calcium, A c-reactive protein, Alkaline phosphatase.

## Introduction

Coronaviruses are a family of viruses that can cause respiratory illness in humans. They are called “corona” because of crown-like spikes on the surface of the virus. Severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS) and the common (Cao, 2020). Interleukin 10L, is a pleiotropic cytokine known for its potent anti-inflammatory and immunosuppressive effects. Originally identified as a product of T helper cells, IL-10 is now known to be produced by various myeloid- and lymphoid-derived immune cells participating in both innate and adaptive immunity (Hao et al, 2020).

Vitamin D3, is also known as cholecalciferol which promotes the absorption of calcium and phosphorus in the body that regulates bone growth. It is commonly found in humans and animals produced on our skin when exposed to sunlight. It facilitates bone growth and mineralization indirectly by enhancing plasma calcium and phosphorus (Sigde,2020).

Iron is an important mineral that helps maintain healthy blood. A lack of iron is called iron-deficiency anemia is the most common nutritional deficiency worldwide, causing extreme fatigue and lightheadedness. It affects all ages, with children, women who are pregnant or menstruating, and people receiving kidney dialysis among those at highest risk for this condition (Andress and, star, 2020). Calcium is closely associated with virus-related multiorgan infections and an increase in inflammatory cytokines. Studies have shown low calcium in the early stage of viral infection. The severe case showed a significantly lower calcium level than mild cases. The reason for low calcium is that some proteins alter calcium channels in host cells and thus allow calcium ions. Outside the cell to get inside the cells needs more (Yang et al, 2020).

Phosphorus is a mineral that makes up 1% of a person's total body weight. It is the second most abundant mineral in the body. It is present in every cell of the body. Most of the phosphorus in the body is found in the bones and teeth. (Yang y, 2020) C-reactive protine a protein made by liver. It's sent into bloodstream in response to inflammation. Inflammation is the body' way of protecting the tissues if theg've been injured or have an infection (Huang c and wang y, 2019).

## Materials and Methods

This study was conducted during the period from September 2021to November 2021 period a study (100) sample, Control unvaccinated, Control vaccinated, unvaccinated recovering, vaccinated recovering, Patien. Were diagnosed by specialized doctors at Alfya Lab in Mousl and consist of (30) Control unvaccinated and (23) Control vaccinated, (25) unvaccinated recovering (25) vaccinated recovering, (7) the Patients of virus corona Of the same age, about 5 ml of venous blood sample was withdrawn from patients and control group. The serum was separated by centrifugation at a rate of (3000 rpm) for 10 minutes. Each sample

was directly analyzed for and Interleukin10, and, iron other biochemical parameters.

- 1 Interleukin 10 was measured using competitive enzyme-linked immunosorbent absorption (ELISA).Cat.No.20211104.
- 2 VitminD3 were determined by VITROS ECIQ from Diagnostics orthoclinical (USA), Cat.No.1300.Cat No.1008533280 for vitmin D3.
- 3 C-reactive protein was determined by colorimetric method using BIOLABO group (France) Cat.No.318128.
- 4 alkaline phosphatase was determined by colorimetric method using BIOLABO group (France) Cat.No.061916A.
- 5 Calcium was determined by CPC method using BIOLABO kit (France) Cat No.052010A.
- 6 Phosphorus was determined by CPC method using BIOLABO kit (France) Cat.No.061930A.
- 7 Iron was determined by colorimetric method using BIOLABO group (France) Cat.No.121915A.

## Results and Discussion

Table (1)

Levels of interleukin 10, vitminD3 and minerals in the serum of patients compared with Control unvaccinated, Control vaccinated, unvaccinated recovering, vaccinated recovering, Patients of virus corona

|                       | groups               |                    |                         |                       |                |
|-----------------------|----------------------|--------------------|-------------------------|-----------------------|----------------|
|                       | Control unvaccinated | Control vaccinated | unvaccinated recovering | vaccinated recovering | The Patients   |
| <i>Interleukin 10</i> | 95.6±44.5a           | 90.8±42.6a         | 95.6±44.5a              | 1866±657.3c           | 2235±386.1b    |
| <i>Vitamin D</i>      | 13.0±1.88b,d         | 12.8±1.0a          | 12.0±0.97a              | 12.0±0.97b            | 10.6±0.84b     |
| phaphorus             | 0.9±0.134a           | 0.9±0.134a         | 0.9±0.132a              | 0.8±0.174b,c          | 0.53±0.082b    |
| alkaline phosphatase  | 92.4±29.30a          | 90.3±28.4a         | 91.4±28.6a              | 95.4±30.70c           | 156.4±43.7b,c8 |
| C-reactive protein    | 9.5±5.57b            | 9.0±5.0e           | 9.7±5.8b                | 15.1±5.86a,b          | 96±0a          |
| Calcium               | 7.25±1.75a           | 7.1±1.32a,b        | 7.0±1.32a               | 6.4±0.96c             | 3.24±0.94b     |
| Iron                  | 14.0±1.7a            | 14.0±1.7a          | 6.4±0.96c               | 7.0±1.32a             | 11.6±1.12d     |

\*interlounkin 10 table (1) showed ansignificantat increase at the probability of(P < 0.05) for levels of interlounkin 10 in the serum of Patients of virus corona and vaccinated group in compared to control group and unvaccinated group several studies indicate that IL-10 levels predict poor outcomes in patients with COVID-19. Based on interleukine 10 (Huang, 2020) (A common feature and presumable cause of death among patients with severe cases of the coronavirus disease 2019 (COVID-19; caused by the SARS-CoV-2 virus) is the overproduction of pro-inflammatory cytokines arising from excessive immune cell activation (i.e., cytokine release syndrome, often referred to as “cytokine storm”. The dramatic early rise in IL-10 – canonically classified as an anti-inflammatory cytokine (Huang and wang 2020)

\*Vitamin D3: the results in table (1) also showed a significant decrease in Vitamin D3 levels at the probability of ( $P \leq 0.05$ ) in serum of patients and vaccinated group compared to control and non-vaccinated group that vitamin D-deficient areas have a higher prevalence of COVID-19 patients (Corman and Landro2020). Descriptive and observational studies have reported that higher prevalence of mortality and critical cases of COVID-19 are more common among vitamin D-deficient patients. (Corman and Landro2020) of vitamin D status in the of COVID-19 and the putative utility of vitamin D supplementation in therapeutics concluded that poor vitamin D status seems to be associated with an increased pathogenesis risk of infection. There is a need to generalize and summarize the findings of individual studies to synthesize evidence that helps make COVID-19 prevention effective (Huang, 2019).

\*CRP: table (1) also showed a significant increase at the probability of ( $P \leq 0.05$ ) for levels of in serum of patients and vaccinated groups compared to control and non-vaccinated groups.

Excessive inflammation is considered to be the main cause of critical illness and death in patients with COVID-19 (Kamal, 2020). CRP is a sensitive index to evaluate the tissue injury. CRP levels are obviously increased when there are acute inflammation\*. CRP can recognize various pathogens and injured or necrotic cell components by combining with C-polysaccharide on the bacterial cell wall. It forms various complexes with C-polysaccharide and phospholipid and can activate the complement system in classical way to remove these pathogens and necrotic cells (Kamal and Hakeem 2020).

\*Alkaline phosphatase: the results in table (1) also showed a significant increase in alkaline phosphatase activity in serum of patients and vaccinated group compared to control and non-vaccinated group,

Abnormal levels of ALP can be caused by liver problems and other types of health problems (Bloomp., 2020) which may indicate inflammation of bile ducts. (Bloomp. and Megero 2020).

\*Calcium: The results in table (1) showed there was a significant decrease in levels in the patients and vaccinated group compared to control and non-vaccinated patients. Some studies observed low calcium level in the early stage of viral infection, (Fanz, 2020) low calcium level related to injuries population (Fanz, et al, 2020).

\*Phosphorous: the results in table (1) showed a significant decrease in phosphorous levels in the patients and vaccinated group compared to control and non-vaccinated patients, some studies showed that phosphate is deficient in COVID-19 (Rondanelli, 2020) phosphate showing a remarkable correlation with its severity, patients with COVID-19 phosphorous deficiencies, ideally already in the early phases of infection. (Rondanelli, 2020).

\*Iron: the result in table (1) showed there was a significant decrease in levels in the patients and vaccinated group compared to control and non-vaccinated group, deficiency was detected in the patients with COVID-19, the severity and mortality of the disease was closely correlated with serum iron levels. Low serum iron concentration was an independent risk factor for death in COVID-19 patients (18).

Table (2)  
Correation between interleukin 10 and Biochemical parameters

| Positive | Negative | Biochemical parameters      |
|----------|----------|-----------------------------|
| 0.1627   |          | Iron (ug/dL)                |
| 0.0312   |          | Calcium (mg/dL)             |
|          | -0.295   | Phaphorus((mg/dL)           |
|          | 0.0588   | alkaline phosphatase(mg/dl) |
|          | -0.233   | C-reactive protein(mg/dl)   |
|          | 0.302    | Vitamin D(mg/dl)            |

Table 2show Positive + correlation with Iron, Calcium and negative with Phospharou, Alkaline phosphatase, Vitmin D3, CRP.

Table (3)  
Effect of age on the levels of interleukine10, vitmin D3 minerals the serum of Patients of virus corona the patients compared to control.

| Biochemical parameters            | Age group (Mean $\pm$ Standard Deviation) |                      |                                 |                       |                        |                    |
|-----------------------------------|-------------------------------------------|----------------------|---------------------------------|-----------------------|------------------------|--------------------|
|                                   | Age group(18-32) year                     |                      | Age group(-48-32) year          |                       | Age group(50-70) years |                    |
|                                   | Control (n=23)                            | Patient (n=25)       | Control (n=13)                  | Patient (n=10)        | Control (n=8)          | Patient (n=10)     |
| Interleukine10 hormone (pg/ml)    | $\pm 77.35$<br>39.7a                      | 2698.2 $\pm$ 313d    | $\pm 162.9$ 113.7<br><u>a,c</u> | 1723.7 $\pm$ 379.5b   | 244.5 $\pm$ 330.2d     | 3642 $\pm$ 3451c   |
| <u>Vitmin D</u> (mg/dl)           | $\pm 13.81$ .35a                          | $\pm 13$<br>1.48b    | 13.1 $\pm$ 1.34a,b              | $\pm 12.7$<br>0.85b   | 12.5 $\pm$ 2.80d       | 11.7 $\pm$ 1.31a,b |
| Calcium (mg/ <u>dL</u> )          | 7.5 $\pm$ 1.15a                           | $\pm 6.3$<br>1.54b   | $\pm 6.9$<br>1.33d              | $\pm 5.8$<br>1.12c    | 7.28 $\pm$ 0.98a       | 5.13 $\pm$ 1.88d   |
| Iron (mg/ <u>dL</u> )             | $\pm 14.51$ .70a                          | $\pm 13.7$ 11.34a,b  | $\pm 15.2$<br>1.54c             | $\pm 12.7$<br>1.16a   | 14.1 $\pm$ 1.42b       | 12.9 $\pm$ 1.67a,b |
| <u>Phaphorus</u> (mg/ <u>dL</u> ) | $\pm 0.900$ .193a                         | 0.82 $\pm$ 0.97b     | $\pm 0.91$<br>0.169a,b          | 0.90 $\pm$ 0.165a     | 0.97 $\pm$ 0.066d      | 0.75 $\pm$ 0.295c  |
| C-reactive protein(mg/dl)         | $\pm 8.254$ .68b                          | $\pm 23.4$<br>25.17a | $\pm 7.71$<br>2.71c             | $\pm 26.4$<br>23.87b  | 10.5 $\pm$<br>5.80a    | 52 $\pm$ 39.59a    |
| Alkaline phosphatase(mg/dl)       | $\pm 95.22$<br>30.3a                      | $\pm 114$<br>37.6b   | $\pm 94.2$<br>37.2a,c           | $\pm 93.36$<br>43.67c | 101 $\pm$ 15.98d       | 129 $\pm$ 36.76a,b |

The resultes in table (3) showed that the female with the age of (50-70) years were more affected with the severity of the disease , although all age groups are at risk of contracting COVID-19, older people face significant risk of developing severe illness if they contract the disease due to physiological changes that come with ageing and potential underlying health condition ( Guan,2020) The study showed that many older people are enduring increased and sometimes devastating levels of anxiety, in part because they know they are at serious risk from the virus – an invisible deadly enemy.(Byambosuren o,2020)

Table (4)  
Effect of sex on the Levels of bio chemical the patients compared to control

| Biochemical parameters           | Man group (Mean $\pm$ Standard Deviation) |                      |                    |                    |
|----------------------------------|-------------------------------------------|----------------------|--------------------|--------------------|
|                                  | W o man group                             |                      | Man group          |                    |
|                                  | Control<br>(n=25)                         | Patient<br>(n=25)    | Control<br>(n=25)  | Patient<br>(n=25)  |
| Interleukin 10hormone<br>(pg/ml) | a<br>95.7 $\pm$ 48                        | 2342.7 $\pm$ 2530a,b | 102.3 $\pm$ 12.9a  | 2956 $\pm$ 3608c   |
| Vitmin D(mg/ml)                  | 12.6 $\pm$ 1.56a,c                        | 12.0 $\pm$ 1.46b,c   | 15.6 $\pm$ 2.6a    | 12.7 $\pm$ 1.6d    |
| phaphorus(mg/dL)                 | 0.96 $\pm$ 0.18a                          | 0.80 $\pm$ 0.22b     | 0.92 $\pm$ 0.25a,b | 0.75 $\pm$ 0.20a,c |
| iron (mg/dL)                     | 14.3 $\pm$ 1.56a                          | 14.0 $\pm$ 1.54b     | 15.0 $\pm$ 0.66d   | 13.7 $\pm$ 0.99c   |
| Calcium (mg/dL)                  | 7.62 $\pm$ 1.34a                          | 6.57 $\pm$ 1.57a,b   | 8.0 $\pm$ 0.53b,c  | 5.6 $\pm$ 1.58c    |
| C-reactive<br>protein(mg/dl)     | 8.4 $\pm$ 4.8a,b                          | 28.11 $\pm$ 28.7d    | 7.2 $\pm$ 2.4a     | 29.0 $\pm$ 29.1c,e |
| alkaline<br>phosphatase(mg/dl)   | 95.4 $\pm$ 29.7a                          | 108.4 $\pm$ 40.8b    | 93.9 $\pm$ 26.1a,b | 102.3 $\pm$ 33.3d  |

The results in table (4) showed that there was a significant increase in the levels of Interleukin10, A c-reactive protein, Alkaline phosphatase and significant decrease in the levels of iron, calcium Vitamin D3 in serum of female group in comaperation with male group, higher death rates among men than women across the lifespan. While pre-existing comorbidities and social, behavioral, and lifestyle factors contribute to this bias, biological factors underlying the host immune response may be crucial contributors (Balan and, Brodeur2020). Women mount stronger immune).whereas age, sex, and comorbidities seemed to play a more important role in COVID-19 severity and mortality responses to infections and vaccinations and outlive men. Sex-based biological factors underlying the immune response are therefore important determinants of susceptibility to infections, disease outcomes, and mortality. , Lower testosterone levels can contribute to erectile dysfunction, as well as decreased energy, libido and muscle mass. Lower testosterone levels also could exacerbate the body's inflammatory response, causing heightened damage to the blood vessels. And because estrogen boosts and strengthens immunity of woman (Wang et al, 2020)

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