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Evaluation of some Biochemical Markers in Serum of Patients with COVID-19 infection and Healthy Subjects Receiving Pfizer Vaccine in Babylon – Iraq

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Abstract

Coronavirus disease 2019 (COVID-19), also called SARS-CoV2 (severe acute respiratory syndrome coronavirus 2), is a kind of coronavirus, an enveloped RNA beta Coronavirus belonging to the Coronaviridae family. It's been linked to a variety of respiratory illnesses, from mild to severe. This study aims to evaluate the levels of alkaline phosphatase (AlP), Albumin, and uric acid in the three groups: 50 blood samples were obtained from healthy people (group I), 50 blood samples were drawn from COVID-19 patients unvaccinated (group II), and 50 samples were obtained from COVID-19 patients vaccinated with Pfizer (group III). This prospective case-control study included a total of 150 Iraqi subjects aged ranged (15-65) years old and their BMI was normal. The mean serum uric acid level of the three groups was (4.83±0.856, 7.3±0.83, and 6.38±0.57) mg/dl, respectively. AlP levels were (77.68±22.05, 90.52±37.89, and 79.84±24.002) U/l, respectively. Albumin levels were (4.35±0.84, 3.73±1.28, and 5.23±6.94) mg/dl, respectively. The results showed a significant increase in uric acid in the unvaccinated group than in other groups. While alkaline phosphatase and albumin levels showed no significant difference amongst groups. The study concluded that the Pfizer vaccine decrease uric acid while not affecting albumin and AlP, which were normal in the groups.

Keywords

COVID-19, Alkaline Phosphatase, Uric Acid, Albumin, Vaccine, Pfizer.

Coronavirus disease 2019 (COVID-19), often called SARS-CoV2 (severe acute respiratory syndrome coronavirus 2), is a kind of coronavirus [1]. An enveloped RNA beta Coronavirus belonging to the Coronaviridae family has been discovered. It's been linked to a variety of respiratory illnesses, from mild to severe [2]. It is a new infectious agent, according to the World Health Organization (WHO), that creates worldwide public health problems. SARS-CoV2 has grown into a pandemic much too quickly, since it was merely an epidemic outbreak when it was initially discovered in Wuhan, China. The first patient with SARS-CoV2 in Iraq was found on February 24, 2020, at Al-Najaf, Iraq; thereafter, further cases were publicly registered [3].

Middle East respiratory disease (MERS) and SARS-CoV2 have greater fatality rates than SARS-CoV2; nevertheless, SARS-CoV2 is more deadly than seasonal flu. SARS-CoV2 is more likely to kill immunocompromised individuals with chronic conditions and the elderly, although younger patients with no severe underlying infections or disorders may still develop potential deadly consequences such as disseminated intravascular coagulopathy and fulminant myocarditis [4]. The severity of coronavirus disease 2019 (COVID-19) varies greatly from person to person, ranging from asymptomatic infection to serious illness needing mechanical breathing. Such variation highlights the need for new biomarkers linked to illness outcomes.

We predicted that low blood uric acid levels (hypouricemia) may be linked with the severity and prognosis of COVID-19 since SARS-CoV2 infection promotes kidney proximal tubules dysfunction and urine loss of uric acid [5].

There has been no follow-up on the connection between hypoalbuminemia and infection severity, and it is unknown if serum albumin is a suitable biomarker for monitoring infection severity [6]. Serum albumin, a negative acute-phase reactant, has been periodically proposed as a predictor of severity during acute infections because its levels may decrease early, depending on the severity of the inflammatory process. The role of hypoalbuminemia in the initial assessment of patients with sepsis remains the subject of ongoing debate [7]. The severity of coronavirus disease 2019 (COVID-19) varies greatly from person to person, ranging from asymptomatic infection to serious illness needing mechanical breathing. Such variation highlights the need for new biomarkers linked to illness outcomes. Because SARS-CoV2 infection results in kidney proximal tubule malfunction and uric acid loss via the urine [5]. In patients with SARS-CoV2 infection, liver dysfunction has also been reported as a common clinical manifestation but is most often mild. Previous studies suggested that patients with abnormal liver tests had significantly higher odds of developing severe pneumonia. However, the clinical significance, underlying mechanisms, and changes in liver function abnormality during hospitalization and its risk factors in COVID-19 patients are still unclear [8]. In recent years, the globall coronavirus 2019 (COVID-19) pandemic has caused significant morbidity and death throughout the globe. The introduction of new vaccinations seems to be influencing the course of events in a positive way right now. Along with the obvious advantages of immunization programs in many nations, vaccine side effects are still an issue that must be addressed. Major adverse effects do not seem to be prevalent [9].

Materials and Methods

Study Design and Sampling

The study was carried out at the department of biochemistry, College of Medicine, University of Babylon. The study's duration extended from March to July 2022. The subjects in this prospective case-control study included 150 Iraqi subjects (aged 15-65) years, and BMI was normal. 150 blood samples for biochemical tests, were collected from three different groups. 50 samples were collected from healthy persons (group I), and 50 samples were collected from COVID-19 patients attended to Hilla Teaching Hospital and Merjan Medical City in Babylon, who were not vaccinated (group II). The last 50 samples were collected from COVID-19 patients who were vaccinated with Pfizer (group III). All groups included equal numbers of males and females with normal measured BMI. The target parameters were alkaline phosphatase, Albumin, and uric acid.

Those with a history of hypertension, vascular heart or cerebral disease, diabetes, arthritis, hepatic cirrhosis, pregnancy woman, tuberculosis, malignancy, or connective tissue disorders, were excluded from this study.

Parameters Assessment

The biochemical analysis of uric acid was measured by Spectrophotometer OPTIMA / Japan and determined by a specific kit from BIOLABO, France. Albumin and alkaline phosphatase were measured by Human (ALB ELISA Kit) and (ALP Activity Assay Kit) − Elabscience® ELISA Kit (USA).

Statistical analysis

The statistical assays were conducted by SPSS version 23 to evaluate biochemicall data. The t-test is used to determine the mean and standard deviation. The significant p-value was considered as such if it reach less than or equal to 0.05 in this study.

Results

The mean ages of the studied groups (group I, group II, and group III) were 41.02±10.82, 47.46±12.95, and 39.54±12.26, respectively, with no significant difference among the groups. Uric acid levels revealed a significant difference among the groups 4.83±0.856, 7.3±0.83, and 6.38±0.57 mg/dl, respectively. AIP levels among the groups were 77.68±22.05, 90.52±37.89, and 79.84±24.002 U/l, respectively. A significant difference between (group I vs group II) was found only, with no significant difference between (group I vs group III) and (group II vs group III). Albumin revealed a significant difference among the groups 4.35±0.84, 3.73±1.28, and 5.23±6.94 mg/dl, respectively, (Table 1).

Table 1: The mean age, uric acid (mg/dl), AIP (U/l), and albumin (mg/dl) among the three study groups: group I healthy people (n=50), group II COVID-19 patients unvaccinated (n=50), and group III COVID-19 patients vaccinated with Pfizer (n=50).

Parameters	Group **I** mean±SD	Group **II** mean±SD	Group **III** mean±SD	P- Value
Age	41.1±10.8	47.5±12.9	39.54±12.3	*0.08
				**0.5
				***0.06
Uric acid	4.8±0.9	7.3±0.8	6.4±0.8	*0.000
				**0.000
				***0.000
Alkaline phosphatase	77.7±22.1	90.5±37.9	79.8±24.0	*0.03
				**0.7
				***0.07
Albumin	4.4±0.8	3.73±1.3	5.2±6.9	*0.5
				**0.3
				***0.07

*Group I vs. group II, **group I vs. group III, ***group II vs. group III

The correlation results showed that the relation between uric acid and AIP was negative linear relation. The relations between uric acid and albumin were linearly positive. Also, the correlations between albumin and AIP were linearly positive, (Figures 1, 2, and 3).

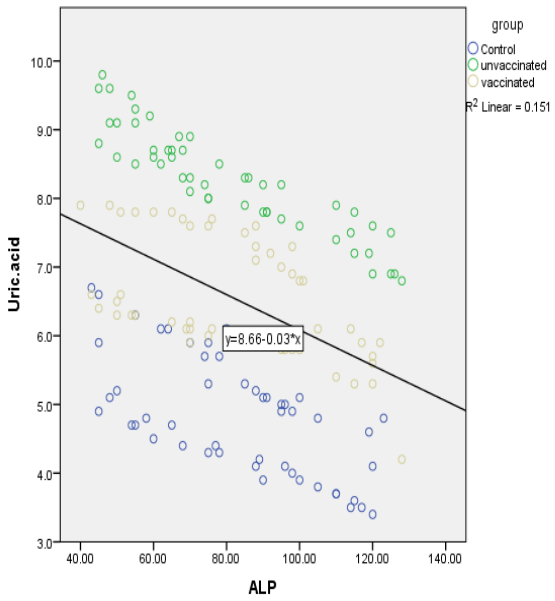

Figure 1: The correlations between uric acid (mg/dl) and alkaline phosphatase U/l

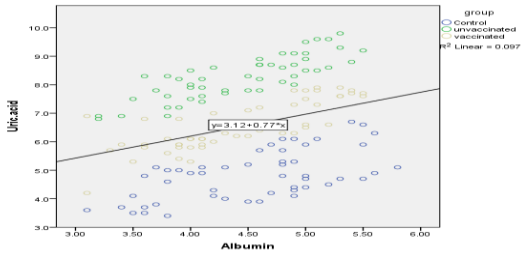

Figure 2: The correlations between uric acid (mg/dl) and albumin (mg/dl)

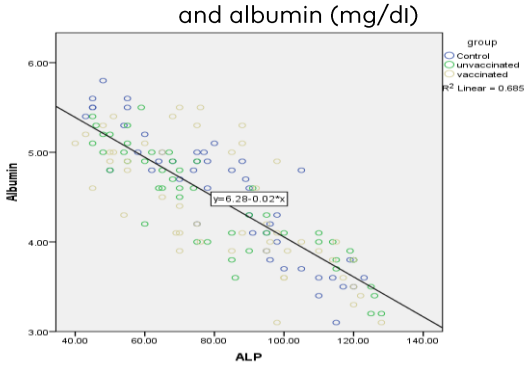

Figure 3: The correlations between albumin (mg/dl) and alkaline phosphatase (U/l)

Discussion

Uric acid levels increased significantly in the non-vaccinated group of patients as compared to the other groups, reaching 7.3±0.83 in the non-vaccinated group and 6.38±0.57 in the vaccinated group, indicating the vaccine's efficacy in minimizing illness symptoms. Uric acid is the end product of purine metabolism in humans. In individuals without uricase, the final result of purine metabolism is uric acid, which is produced in the liver by xanthine oxidase. Because it excretes the majority of total body uric acid, the kidney is an essential regulator of circulating uric acid levels. [10]. The glomeruli filter serum urate freely, followed by a complicated balance of reabsorption and secretion in the proximal tubule of the kidney [11]. SARS-CoV2 produces a particular malfunction of the kidney proximal tubule, as shown by low molecular weight proteinuria, neutral aminoaciduria, and poor tubular uric acid processing in recent research [12]. Irregular

uricosuria was linked to illness severity and the requirement for mechanical ventilation in a group of 49 individuals with particular urinalysis [12]. It has not been determined if blood uric acid levels, which are readily accessible, may be employed as a surrogate for the tubular dysfunction and as a biomarker of disease severity and outcome in COVID-19 [5]. Through previous studies and the results of the current study, it was found that COVID-19 has an effect on the urinary system and can cause uric acid to rise. The current study showed a higher uric acid in the group of unvaccinated people than in the group of vaccinated people, and this is an important indicator of the effective role of the vaccine against complications of the disease.

AIP did not show significant statisticall significance, as there was no significant difference between the vaccinated group and the non-vaccinated group. In a previous study consisting of 74 patients with COVID-19, only 12 (20.3%) had abnormal AIP activity [13]. Also another study consists of 91 patients with COVID-19 only 12 % had abnormal AIP activity. Through the previous studies and the current study, it seems that AIP is not significantly affected by COVID-19. Although evidence from several studies demonstrates a link between COVID-19 and abnormal liver function tests (LFTs) regardless of health-care context, [14-17]. Recent epidemiological and clinical investigations on LFTs in patients with SARS-CoV2 infection, on the other hand, are most inconsistent and conflicting [18-21].

The levels of albumin in all groups did not differ substantially. Serum albumin levels were shown to steadily drop in both severe and non-severe COVID-19 patients in recent research. Furthermore, 17.7% of the COVID-19 patients had hypoalbuminemia at least once in three consecutive weekly periods. Hypoalbuminemia induced by COVID-19 infection was previously linked to a cytokine release syndrome, or "cytokine storm," which was linked to a bad prognosis in these individuals. Poor prognosis was also linked to age and comorbidities. [15], [22]. Another research, on the other hand, found that hypoalbuminemia was linked to COVID-19 infection outcomes regardless of age or comorbidities [23]. Low albumin levels were also linked to a poor outcome in COVID-19 patients, as determined by the duration of stay in the hospital and death [24].

Conclusions

Uric acid levels increased significantly in the non-vaccinated group of patients as compared to the other groups, indicating the vaccine's efficacy in minimizing illness symptoms. Patients who were vaccinated showed increased albumin more than those who were unvaccinated, the vaccine decreased the effect of COVID-19 on the kidney. While the AIP had not been affected by COVID.

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