

COVID-19 with Hyperglycemia Among Iraqi Patients in Baghdad

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Abstract

Background: The corona virus infects many organs of the body other than the respiratory system. It is necessary to highlight other infections caused by COVID-19 and therefore, the objective of our research is to study the relationship between the novel coronavirus and hyperglycemia, and its impact on some biochemical parameters in the serum of Iraqi patients. **Material and Methods:** The study, which took place in Abu Ghraib-Baghdad from September to December 2021. The findings of subjects who suffer from high blood sugar were selected from the tests that were conducted for many COVID-19 patients in our laboratory, and they were not suffering from this rise previously, and they are forty subjects (20 males and 20 females). The ages of all participants was ranged from 40 and 60 years. They were found to be infected with COVID-19 after a Real-time polymerase chain reaction test from nasopharyngeal swabs. Measured the body mass index, fasting plasma glucose, glycosylated hemoglobin, some positive acute phase reactants (C-reactive protein and D-dimer), and lactate dehydrogenase in the serum. **Results:** All patients studied had elevated fasting plasma glucose and glycosylated hemoglobin levels. C-reactive protein and D-dimer were also elevated but lactate dehydrogenase was high in 32.5% of the studied patients. The mean of body mass index was 28.73 ± 4.51 kg/m² (overweight). **Conclusion:** We concluded that COVID-19 caused hyperglycemia in some Iraqi patients at Baghdad, in addition to respiratory infections.

Keywords: Iraq-Baghdad; COVID-19; Biochemical parameters; Hyperglycemia.

1. Introduction

The novel viral disease SARS-CoV2 (COVID-19) appeared in China and spread worldwide since December 2019 until now; it entered Iraq on February 24, 2020, when the first case of COVID-19 was reported for a traveler who entered the city of Najaf and spread to all cities of Iraq.¹ The pandemic Coronavirus had several mutations from December 2020 to the present, five variants of COVID-19 appeared in the United Kingdom, South Africa, Brazil, India and multiple countries, namely Alpha, Beta, Gamma, Delta and eventually Omicron respectively.²

The angiotensin-converting enzyme 2 (ACE2) receptor is used by SARS-CoV2. The coronavirus infects kidneys, testis, digestive system, liver, and pancreas, in addition to the respiratory system, since these receptors (ACE2) are found in many cells of the organs.³ Because the ACE2 receptor is strongly expressed in pancreatic islet cells, infection with SARS-CoV-2 might theoretically result in islet destruction and severe diabetes, but there was no statistically significant link between pancreatic damage and the severity of COVID-19.^{3,4}

Older age, male gender have a higher chance of serious or fatal illness, and comorbidities such as hypertension, diabetes, cardiovascular disease, and respiratory disorders may have a significant impact on the COVID-19 prognosis.^{5,6} Obesity has identified as a risk factor for the severity of sickness in people who have been infected with COVID-19.

An increasing number of studies have connected obesity to more severe COVID-19 disease and mortality. Obesity and diabetes are both known to be high-risk factors for severe coronavirus infection.^{6,7} Diabetes is becoming more well recognized as a risk factor for the prognosis of the novel coronavirus disease. Increased blood glucose is linked to severe COVID-19. Diabetes patients in COVID-19 had a higher mortality rate. However, there have been conflicting reports on the influence of glycemic management on COVID-19 result.^{8,9}

The glycosylated hemoglobin (HbA1c) reflects average glycaemia over the preceding 2 to 3 months. Some studies found a link between HbA1c levels at admission and disease progression or death in COVID-19 patients, whereas others did not. While the causes behind the disparity are unknown.¹⁰

Glucose is the most abundant free sugar in human blood and the source of energy for all cells. COVID-19 patients' illness progression and mortality are predicted by their age, increased glucose levels, and clinical signs associated to systemic inflammatory responses and multiple organ failures. There is evidence that severe COVID-19 is linked to elevated blood glucose levels, as a result, it's critical to emphasize the need of accurate blood glucose monitoring to enhance prognosis in COVID-19 patients.^{11,12}

Any anomaly in amylase or lipase levels, in the blood, was considered as pancreatic damage. Several mechanisms can cause pancreatic damage in people with severe COVID-19.¹³ C-Reactive

Protein (CRP) levels were closely connected to lung lesions in the early stages of COVID-19 infection and may indicate disease severity, and CRP levels were high in those who died from COVID-19 infection, indicating that it might be a helpful diagnostic for identifying disease severity. Patients with high CRP or LDH (Lactate Dehydrogenase) should be closely monitored and, if necessary, transferred to an intensive care unit. Elevated LDH was found in 44% of infected people.^{14,15}

The D-dimer is a fibrinolysis product that circulates at low levels in healthy blood plasma. From the outset of COVID-19 sickness, measuring the quantity of D-dimer and coagulation factors can assist regulate and manage the condition. COVID-19 patients with severe variations had significantly higher blood D-dimer concentrations than those with milder variants.¹⁶

Searched the database of PubMed, Google Scholar, and Iraqi Academic Scientific Journals for biochemical studies on Iraqi COVID-19 patients, and found a rarity of these studies and no results for diabetes. It is necessary to follow up on COVID-19 patients by doing analyzes for biochemical compounds in the patient's blood, so one of our goals was to learn more about the disease's impact.

2. Materials and Methods

The study were conducted, between September and December of 2021, at a private laboratory in Abu Ghraib, Baghdad-Iraq. Through the tests that were conducted for many COVID-19 patients in our laboratory, the results of those who suffer from high blood sugar were selected and they were not suffering from this increase previously, and they are forty subjects (20 males and 20 females). The ages of all participants was ranged from 40 and 60 years. Through a RT-PCR test from nasopharyngeal swabs, it was determined that they were infected with COVID-19.

All individuals were given a questionnaire that included their age, gender, clinical history for comorbidities (Hypertension, diabetes.), symptoms, illness site, and duration. All of the research participants are free of chronic conditions such as diabetes, hypertension, and so on.

Weight and height of all patients were measured

BMI = Weight (kg)/Height (m²), was used to determine the body mass index (BMI). The BMI

was calculated by multiplying the weight (kg) by the square of the height (in meter) and was classified using the World Health Organization's (WHO) international categorization system: Underweight (less than 18.5 kg / m²), Normal Weight (18.5 – 25 kg / m²), and Overweight (25 – 30 kg / m²).¹⁷

A total of 5 mL of blood was obtained from each subject.

Various equipment, devices, and apparatuses were employed in this study

Fineware™ FIA Meter Plus for D-dimer, C-Reactive Protein, LDH and Glucose.

SD MultiCare for HbA1c. All Kits used are from Fineware.

Normal range of: D-dimere (0 - 0.5 μg/mL), CRP (0 -10 mg/L), LDH (120-220 U/L), Fasting blood glucose (70-110 mg/dl), HbA1c (less than 6 %).

For each parameter.

3. Results

This research comprised totally of 40 participants with COVID 19 infection (20 men and 20 women), from the city of Abu Ghraib, Baghdad- Iraq. As shown in the table 1: The mean of men age was 52.3±9.77 years and for the women was 54.9±6.59 years. The mean of men body mass index (BMI) was 28.36±3.64 kg/m² and for women was 29.1±5.38 kg/m². Accordingly too the international classify system, it as with in the overweight rang value.

The Choosing patients had elevated fasting plasma glucose (FPG) levels. The mean of FPG in the men was 197±44.39 mg/dl, and in the women was 182±52.19 mg/dl. The mean of glycosylated hemoglobin (HbA1c) had also elevated over the normal levels in the men and women (8.68±0.91% and 8.33±1.51% respectively).

Patients with COVID-19 had higher levels of two biochemical parameters (CRP and D-dimer), while the serum LDH within the normal range, as shown in table 2. The mean of CRP in the men was 44.76±22.62 mg/L, and in the women was 41.57±21.15 mg/L. The mean of D-dimer had also elevated over the normal levels in the men and women (0.79±0.47 and 0.78±0.51 μg/mL respectively).

The mean of serum LDH was within the normal range (211.05±45.07 U/L in men and 207.8±38.12 U/L in women), but elevated in 13 out of 40 patients (32.5 %).

TABLE 1. Shows the description of parameters regarding COVID-19 infection.

Parameters	Gender	Mean ± SD	Units
Age	Men	52.3±9.77	Years
	Women	54.9±6.59	
BMI	Men	28.36±3.64	kg/m ²
	Women	29.1±5.38	
Fasting Plasma Glucose	Men	197±44.39	mg/dl
	Women	182±52.19	
HbA1c	Men	8.68±0.91	%
	Women	8.33±1.51	

TABLE 2. Shows the impact of COVID-19 on three biochemical parameters.

Parameters	Gender	Mean \pm SD	Units
CRP	Men	44.76 \pm 22.62	mg/L
	Women	41.57 \pm 21.15	
D-dimer	Men	0.79 \pm 0.47	μ g/mL
	Women	0.78 \pm 0.51	
LDH	Men	211.05 \pm 45.07	U/L
	Women	207.8 \pm 38.12	

4. Discussion

This is, as far as we know, three first research in Iraqi too look at three impacts of COVID-19 in glucose and glycosylated hemoglobin in serum of Arab Iraqi patients. The COVID patients were selected from men and women with a mean age of 52.3 \pm 9.77 years, who had not diabetes previously.

The body mass index (BMI) of our participants was measured, It was in the overweight range value (28.36 \pm 3.64). Although the effects of COVID-19 on obese individuals have yet to be fully understood, obesity is risk factor for developing sever COVID – 19 .18 Our results show no difference in the effect of COVID-19 on the biochemical parameters studied between men and women.

According to the findings of a systematic review 19, the male sex is major risk factor for this disease. Male patients and those who are elderly or older (over 50 years) are more likely to develop severity, whereas comorbidities and clinical symptoms may have a major impact on COVID-19 prognosis and severity.20

Glucose was elevated in serum of our studied patients with COVID-19. This is in agreement with previous studied11,12, and it is may be due to pancreatic injury.13 COVID-19 can induce acute pancreatitis, although there is yet inadequate data or proof.21 High levels of HbA1c were found in all participants (the mean about 8%). In addition to pancreatic damage, various variables implicated in hyperglycemia and insulin resistance, include medications, activation of inflammatory pathways, and release of stress hormones.22 The majority of the patients in the study of Kamal et al., 2021 23 had several symptoms and disorders after recovering with COVID-19, only 10.8% of the subjects had no symptoms and 4.2% of recovered individuals have diagnosed with diabetes.

C reactive protein (CRP) and D-dimer are positive acute phase reactants (APR). Positive APR is stimulated during inflammation, and its concentration increases. These parameters are frequently employed as indicators of acute illness.24 CRP and D-dimer were high in our studied patients with COVID-19. This study is consistent with other international studies.15 Elevated LDH was seen in 13 out of 40 studied patients (32.5 %), while the mean was in the normal value. Some studies found an association between increased LDH and mortality, whereas others did not.25

5. Conclusion

Our results show that COVID-19 caused hyperglycemia in some Iraqi patients. COVID-19 may produce multisystem dysfunction in the body. It is necessary to follow up on infected patients, and further research is required.

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