REPUBLIC OF TÜRKİYE
KIRŞEHİR AHİ EVRAN UNIVERSITY
INSTITUTE OF HEALTH SCIENCES
DEPARTMENT OF MOLECULAR MEDICINE

THE EFFECT OF COVID-19 ON HBA1C AND FASTING BLOOD SUGAR LEVELS IN DIABETIC PATIENTS

OMAR MOHAMMED FAWAZ AL_ALOOSY

MASTER'S THESIS

KIRŞEHİR-AUGUST/2023

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SUPERVISOR
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KIRŞEHİR-AUGUST/2023

KABUL VE ONAY

‘The Effect Of Covıd-19 on HbA1c and Daıly Blood Sugar Levels In Dıabetıc Patıents’ adlı bu çalışma 11/05/2023 tarihinde aşağıdaki jüri tarafından Moleküler Tıp Anabilim Dalı, Moleküler Tıp Programında Yüksek Lisans tezi olarak kabul edilmiştir.

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DECLARATION

I declare that all the information in the thesis is obtained and presented within the framework of ethical behavior and academic rules, and in this study, which is prepared in accordance with the thesis writing rules, all kinds of statements that do not belong to me are fully cited to the source of the information.

OMAR MOHAMMED FAWAZ AL_ALOOSY

DEDICATION

To.... that man who taught me pride and eyeliner with pride, the main supporter in my life. My father, may God protect him and prolong his life

To ... the kind soul who wished he would see this work, but moved to God Almighty. Dear Uncle (Ayman)

To.....my dear mother, may God protect her

To.... my beloved wife

To.... my brothers, all my family, friends and everyone who supported me on this path.

Thanks and appreciation:

God said in His Noble Book:

“And whoever is grateful, he is grateful for himself.”

At the beginning of my speech, I must thank God Almighty, who enabled me to reach this high scientific stage and paved the way for me to be among you today to discuss my master's thesis. I also extend my thanks to my dear father, my honorable mother, and my beloved wife, who were the first support for me in establishing what it is now.

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Thanks to the honorable members of the Discussion Committee for accepting the discussion of this master's thesis

May, 2023 ASAAD MOHSIN ABDULLAH ABDULLAH

INDEX

Page

TABLE LIST

Page

FIGURE LIST

Page

ICONS AND ABBREVIATIONS LIST

Icons	Described
±	**:** Plus Minus
%	: Percentage

Abbreviations	Described
COVID-19	: Coronavirus Disease 2019
DNA	: Deoxyribonucleic Acid
GLU	: Glucose
HBA1C	: Glike Hemoglobin
PCR	: Polymerase Chain Reaction
SARS	**:** Severe Acute Respiratory Syndrome

ÖZET

YÜKSEK LİSANS TEZİ

COVİD-19' UN DİYABETİK HASTALARDA HBA1C VE AÇLIK KAN ŞEKER DÜZEYLERİNE ETKİSİ

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Korona virüsü (Covid-19) (Şiddetli Akut Hava Sendromu) tip II (SARS-2), 2019 yılında ortaya çıkmıştır ve tüm dünyaya yayılmıştır. Virüsün diyabetik hastalarda hayati fonksiyonları olumsuz yönde etkilediğini bildiren çalışmalar bulunmaktadır. Virüsün β-hücrelerini direk etkileyerek metabolizma bozukluklarına yol açması diyabetiklerde hastalığın daha ağır seyretmesine neden olabilir. Bu çalışma diyabetik hastalarda Korona virüsün HBA1C ve günlük açlık kan şeker düzeylerine etkisini incelemek amacıyla yapılmıştır. Bu çalışma 1 Şubat 2022-1 Ağustos 2022 tarihleri arasında Irak'ın Ramadi ilinde bulunan bir karantina hastanesinde yürütülmüştür. Çalışmaya 54 kadın, 54 erkek olmak üzere 130 kişi dahil edilmiştir. Çalışma gruplarından 22 kişi diyabetik olmayan kontrol grubunu oluşturmaktadır. 108 kişi ise daha önce diyabet tanısı almış ve Covid-19 testi pozitif olan hastalar oluşturmaktadır. Hastalarda Covid-19 tedavisine başlamadan önce 1. Gün (GLU1) ve tedaviden sonra 2. ve 3. Gün (GLU2 ve GLU3) açlık kan glukoz düzeylerine bakıldı. Ayrıca tedaviye başlamadan önce (HbA1c 1) ve tedaviye başladıktan sonra 2 ay arayla 2 kere (HbA1c 2 ve HbA1c 3) HbA1c düzeyleri incelendi. Grup 2, Grup 3 ve Grup 4 'ün GLU ve HbA1c düzeylerini Kontrol grubu (CONT) (GRUP 1) ile karşılaştırdığımızda

hem GLU hem de HbA1c düzeylerinin yüksek olduğu belirlenmiştir (Sırasıyla p<0,02, p<0,03). Grup 2'nin GLU 1, GLU 2, GLU 3 ve HbA1c 1, HbA1c 2, HbA1c 3 düzeylerinin sırayla 214,63 ± 100,28, 166,58 ± 50.70, 134,10 ± 35.51 ve 10.10 ± 0.21, 8.30 ± 0.29, 6.80 ± 0.31 olduğu belirlenmiştir ve tedavi sonrası ölçülen GLU 2, GLU 3 ve HbA1c 2, HbA1c 3'te azalma olduğu görülmüştür. Grup 3'ün GLU 1, GLU 2, GLU 3 ve HbA1c 1, HbA1c 2, HbA1c 3 düzeylerinin sırayla 175.80 ± 60.38, 215.10 ± 95.73, 268.40 ± 135.51 ve 7.60 ± 0.33, 9.60 ± 0.23, 12.20 ± 0.21 olduğu belirlenmiştir. Bu gruptaki hastaların tedavi sonrası ölçülen GLU 2, GLU 3 ve HbA1c 2, HbA1c 3 düzeylerinde ise artış olduğu görülmüştür. Grup 4'ün GLU 1, GLU 2, GLU 3 ve HbA1c 1, HbA1c 2, HbA1c 3 düzeylerinin sırayla 179.0 ± 62.18, 238.10 ± 115.43, 192.0 ± 86.91 ve 7.90 ± 0.31, 10.70 ± 0.20, 8.70 ± 0.31 olduğu belirlenmiştir. Grup 4 hastalarının tedavi sonrası ölçülen GLU 2, GLU 3 ve HbA1c 2, HbA1c 3 düzeylerinin tedavi öncesine göre yüksek ve sabit olmadığı görülmüştür. Çalışmamız sonuçlarına göre 108 diyabet hastasının 28'inin (Grup 2) tedaviye cevap verdiği ve kan glukoz düzeylerinde azalma olduğu görülmüştür. Hastalardan 28'inin (Grup 3) tedaviye rağmen kan glukoz düzeylerinde artış olduğu belirlenmiştir. 52 hastanın ise (Grup 4) kan glukoz düzeylerinin yüksek ve düzensiz olduğu görülmüştür. Bu sonuçlar bize diyabetik hastaların büyük çoğunluğunda Covid-19 geçirdikten sonra kan glukoz düzeylerinin daha fazla artabileceğini göstermektedir.

Mayıs 2023, 46 Sayfa

Anahtar Kelimeler: SARS-2, Diyabet, Mortalite, Açlık kan glukozu ve HbA1c.

ABSTRACT

M.Sc. THESIS

THE EFFECT OF COVID-19 ON HBA1C AND FASTING BLOOD SUGAR LEVELS IN DIABETIC PATIENTS

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Corona virus (Covid-19) (Severe Acute Air Syndrome) type II (SARS-2) emerged in 2019 and has spread all over the world. There are studies reporting that the virus negatively affects vital functions in diabetic patients. The fact that the virus directly affects β-cells and causes metabolic disorders may cause a more severe course of the disease in diabetics. This study was conducted to examine the effect of Corona virus on HBA1C and fasting blood glucose levels in diabetic patients. This study was conducted in a quarantine hospital in Ramadi, Iraq, between February 1, 2022 and August 1, 2022. 130 people, 54 women and 54 men, were included in the study. 22 people from the study groups constitute the non-diabetic control group. 108 people consist of patients who have been diagnosed with diabetes before and who have positive Covid-19 test. Fasting blood glucose levels were measured on Day 1 (GLU1) before starting Covid-19 treatment and on Day 2 and 3 (GLU2 and GLU3) after treatment. In addition, HbA1c levels were examined before starting the treatment (HbA1c 1) and 2 times (HbA1c 2 and HbA1c 3) with an interval of 2 months after starting the treatment. When we compared the GLU and HbA1c levels of Group 2, Group 3 and Group 4 with the Control group (CONT) (GROUP 1), it was determined that both GLU and HbA1c levels were high ($p<0.02$, $p<0.03$, respectively). GLU 1, GLU 2, GLU 3 and HbA1c 1, HbA1c 2, HbA1c 3 levels of Group 2 were 214.63 ± 100.28, 166.58 ± 50.70, 134.10 ± 35.51

and 10.10 ± 0.21, 8.30 ± 0.29, respectively. , was determined to be 6.80 ± 0.31 and there was a decrease in GLU 2, GLU 3 and HbA1c 2, HbA1c 3 measured after treatment. GLU 1, GLU 2, GLU 3 and HbA1c 1, HbA1c 2, HbA1c 3 levels in Group 3 were determined as 175.80 ± 60.38, 215.10 ± 95.73, 268.40 ± 135.51 and 7.60 ± 0.33, 9.60 ± 0.23, 12.20 ± 0.21, respectively. It was observed that the patients in this group had an increase in the levels of GLU 2, GLU 3 and HbA1c 2, and HbA1c 3 measured after the treatment. GLU 1, GLU 2, GLU 3 and HbA1c 1, HbA1c 2, HbA1c 3 levels in group 4 were determined as 179.0 ± 62.18, 238.10 ± 115.43, 192.0 ± 86.91 and 7.90 ± 0.31, 10.70 ± 0.20, 8.70 ± 0.31, respectively. It was observed that the levels of GLU 2, GLU 3 and HbA1c 2, HbA1c 3 measured after treatment in group 4 patients were higher and not constant compared to before treatment. According to the results of our study, it was observed that 28 of 108 diabetic patients (Group 2) responded to the treatment and had a decrease in blood glucose levels. It was determined that 28 of the patients (Group 3) had an increase in blood glucose levels despite the treatment. It was observed that blood glucose levels of 52 patients (Group 4) were high and irregular. These results show us that the blood glucose levels may increase more after Covid-19 in the vast majority of diabetic patients.

May- 2023, 46 Pages

Keywords: SARS-2, Diabetes, Mortality, fasting blood glucose and HbA1c.

1. INTRODUCTION

A group of atypical interstitial pneumonia cases appeared in 2019, it resulted by severe infection with the SARS-2 virus, which was determined in China, in the city of Wuhan. After a quick diffusion of Covide-19 virus in 2020 on March, the World Health Organization stated this virus is a universal pandemic. Therefore, the necessary measures have been taken to increase health and preventive awareness, in addition to taking preventive measures and reorganizing health hospitals around the world to receive the increasing numbers of patients infected with this deadly virus (1).

At the end of 2019, in China, specifically in Hubei Province, a series of respiratory infections swept. The agent responsible for this viral infection has been identified, and it is a new coronavirus that belongs to the Coronaviridae family called SARS-2. Researchers viewed it as very similar to the SARS-2 coronavirus, which appeared beginning in 2002-2003. The virus responsible for this disease was described as the Covid-19 virus by the World Health Organization, as it was believed that the disease had spread through an animal source from the seafood markets in Wuhan, China. While human-to-human transmission has been identified as being responsible for the transmission of the disease in society, and it has been reported in two hundred countries in the world (2).

In about thirty on January 2020, it was promulgation as a public health emergency, where health emergency declared COVID-19 has been declared pandemic by the World Health Organization. This virus (SARS-2), which spread at a frightening speed all over the world, had its first appearance in China, specifically in the city of Wuhan (3). The number of cases from all over the world was approximately eleven and a half million on July 6, 2020, with nearby 536,893 deaths from the SARS-2 virus, and the cause was the infection of the upper respiratory tract of patients with the virus. Many disease states are associated with a higher risk of mortality including gender, age, hypertension, DM, obesity, cardiovascular disease, COPD and cancers (4-5).

Previous studies have shown that the advanced age of people and the incidence of chronic diseases such as diabetes and high blood pressure are the most vulnerable to infection with the virus-19, and therefore they are at a greater risk of death (6-8). DM as it is known globally, represents the third most important reason of dying around the world as a result of its rapid spread and its contribution to the evolution of many illnesses such as stroke, kidney

failure and heart illness (9). It is like the internationally deadly effect of alcohol abuse, cigarette smoking (10), cancer (11) and other diseases (12). Due to the global outbreak of diabetes, there are frequent ailments between people infected with diseases related with coronavirus-19 (13). In general, the risk of infection with the virus rises with diabetes, as many studies have shown that there is a great similarity between the global spread of diabetes and the spread of infection, as both are affected by many factors such as region, age and ethnicity. Diabetics who control their blood sugar levels are not known to have a raised risk of SARS-2 infection (14). In our study, we decided to study the effect of the Corona virus pandemic on patients infected with it and on others with diabetes and its impact by measuring the proportion, HbA1c, sugar, lipids, kidney function, liver function, for patients and comparing it with the control group of volunteers from infected cases, because It has a significant negative impact on patients affected by it.

Especially on diabetics or patients at risk of developing diabetes, the Corona pandemic has claimed many lives since its appearance in 2019, especially diabetics. The focus and attention has been on diabetics since the beginning of the spread of Covid-19 in China, and the reason is due to the poor diagnosis of those infected with the virus for patients with type 2 diabetes or patients with type 1 diabetes, as both are at risk of severe infection with the virus. The poor prognosis for the infection of diabetics with the Covid-19 virus is due to several factors, and this reflects the nature of the diabetes syndrome in general (DM1 or DM2) (15). As for those recovering from the virus, it has caused them to suffer from complications and chronic diseases after recovering from the virus.

1.1. Aim of the study

• Knowing the negative effects of the Corona virus on infected patients.

• Knowing the negative effects on people with diabetes and others infected with the Corona virus and non-diabetics

• Knowing the extent of its impact on some of the important vital organs in the body through the analysis and measurement of blood sugar, cumulative sugar, kidney function, liver function, fat percentage and the damage caused by this virus.

• Knowing whether there is a relationship between diabetes and the Corona virus on patients in Iraq

2. LITERATURE REVIEW

2.1. Covid-19 & HbA1c

Patients with diabetes who develop COVID-19 have been seen to have a worse prognosis and increased mortality in most studies (22). In 201 Chinese patients with diabetes a hazard ratio of 95% for acute respiratory distress syndrome (ARDS) has been reported. Similarly (23), case fatality rate was 7.3% in patients with diabetes as opposed to 2.3% in those without diabetes in a report of 44,672 patients of COVID-19 by Chinese Centre for Disease Control (24). A recent study in 1122 patients with COVID-19 in 88 centres across the USA found diabetes to be associated with more than fourfold increase in mortality (25). How diabetes increases severity of COVID-19 is unclear, though several factors may be responsible (26). Poor glycaemic control impairs several aspects of the innate and adaptive immune response to viral infections and to the potential secondary bacterial infection in the lungs (22). Defects in immunity namely inappropriate T-cell action, impaired natural killer cell activity and defects in complement action could reduce viral clearance. Interestingly, ARDS in patients with COVID-19 is driven by severe hypoxaemia despite relatively well-preserved lung mechanics. Pre-existing proinflammatory state could accentuate the cytokine storm, which is believed to be responsible for ARDS as well as multi-organ dysfunction in COVID-19 (25). obesity and abnormal secretion of adipokines and cytokines like TNF-alfa and interferon, which may further impair immunity and predispose to severe infection. Further, diabetes is associated with increased plasminogen levels which has been postulated to increase the virulence of SARS CoV-2 (28). Presence of these inflammation and prothrombotic factors has been shown in a study in 174 patients hospitalised with COVID-19 in Wuhan, China; significantly higher serum levels of interleukein 6, erythrocyte sedimentation rate, C-reactive protein, ferritin, fibrinogen and D-dimer were reported in patients with diabetes compared with those without diabetes (36). Increased viral replication in diabetes may also due to an increase in furin, which is a type-1 membrane-bound protease involved in the entry of coronaviruses into the cell (25). In addition, pre-existing comorbidities associated with diabetes like hypertension, coronary artery disease and chronic kidney disease further worsen the prognosis (30). Lastly, hypoglycaemia which could occur during treatment of diabetes may additionally worsen the clinical outcomes (22). In this respect role of angiotensin converting enzyme 2 (ACE2) receptor in pathogenesis of COVID-19 in patients with diabetes is intriguing. SARS CoV-2 enters the cell by binding to

ACE2, a process which involves many steps and several enzymes and proteins (24). There is experimental evidence for downregulation of ACE2 in diabetes, which may predispose to more severe lung injury (23). On the other hand, ACE2 is a receptor for SARS CoV-2 and this downregulation might reduce the entry of virus into cells. Given the increased severity of COVID-19 in patients with diabetes, a case could be made for testing of all people with diabetes for the presence of disease (22). That would be a humongous task considering the high prevalence of diabetes. High-risk groups like those with high HbA1c, those with comorbidities, long duration of diabetes or elderly could be chosen for testing (25).

2.2. Corona Virus Effect On Blood Sugar Levels

The emerging corona virus leads to a disorder in blood sugar levels in some patients, meaning that it does not affect the respiratory system only, but its effect on the entire body, according to what several studies have shown to prove the harm caused by the virus to various other organs of the body such as the heart, blood vessels and nervous system (22, 23). And the digestive system, kidneys, etc., and it can also affect the metabolism process, as some corona patients show a disorder in the blood sugar level, and in severe cases of Covid, some patients show the same symptoms as those with type 1 diabetes (25), which is due to a lack of insulin, and among these Symptoms High blood sugar and high blood acidity, and also during the autopsy of Corona patients, it was found that the infection reaches the pancreas as well (7,8) and even after the disappearance of Corona virus proteins from the lung in some infected cases, the extent of the disease's paths varied and its presence was discovered in the pancreas and from the many evidence that was found So far, many corona patients have developed diabetes (9) either during infection or after recovery, where it is believed that the virus that causes (covid-19, sars covid 2) to It also has the ability to cause a defect in insulin and glucose metabolism, which may cause diabetes (35). One of the ways in which the Corona virus affects the body Many believe that new diabetes cases can rise due to a cytokine storm and nefarious complications related to the virus (viral infection) that force the immune system to turn itself on and produce deadly cytokines that It attacks vital tissues and organs (24) and this makes it difficult for organs to maintain vital functions or produce normal glucose levels (27). Another theory is that the virus may weaken the lining of cells, including the intestines, includes reducing immunity, as how the virus obstructs the pancreas can depend on the way the virus interacts with the ACE2 receptor, where the virus interacts with ACE2 receptors to infiltrate and attack vital organs (24) including the

pancreas, causing disruption in insulin secretion (35). which could undermine the organs' ability to regulate and break down glucose (30). And also the use of many drugs to treat the virus experimentally, as doctors warned that some of these drugs, such as steroidal drugs that are used during treatment (34) can also cause an increase in blood sugar (35,36).

COVID infection lead to Type 1 or Type 2 diabetes: It's not clear if COVID mainly causes Type 1 diabetes, (48) Type 2 diabetes, or maybe even a new subset. Many of the studies looking at this link (including the large CDC study on children) haven't distinguished between Type 1 and Type 2 diabetes (47). Some studies have focused just on Type 1 or Type 2 diabetes. And some studies on adults have found that there's overlap in the symptoms people develop. So, it's not yet clear how to group diabetes caused by COVID (47).

COVID lead to diabetes: Scientists aren't exactly sure how a COVID infection might cause diabetes. But there are a few possible theories: COVID may cause a direct attack on the pancreas, which is the organ that makes insulin (48). Inflammation in the body during COVID may lead to high blood glucose (sugar) levels and changes in the way the body processes glucose (39). COVID may speed up Type 2 diabetes in people with undiagnosed prediabetes (38). Some people might have immunity-related genes that make them more likely to get diabetes from COVID (38).

Changes in health during the pandemic - like weight gain and stress - may have made people more prone to developing diabetes (45).

COVID affect the pancreas: The pancreas is an organ in the body that makes insulin (38) a hormone that keeps your blood glucose levels in balance (44). When the pancreas doesn't work properly (46) it can cause diabetes. Scientists have found that SARS-CoV-2, the virus that causes COVID, can enter and damage the cells of the pancreas (45). Pancreatic cells have angiotensin-converting enzyme (ACE) inhibitors on them, and that seems to be how the virus can enter the cell (44). Once inside the cell, the virus can cause a series of reactions that harm the cell's ability to create insulin (47).

Diagnose diabetes caused by COVID: Diabetes caused by COVID follows the same diagnosis process as regular diabetes. Usually (39), a diabetes diagnosis depends on a blood test that can detect a high blood glucose level. Sometimes, a urine test can also detect diabetes by measuring glucose in the urine (41). But you'll need a blood test to confirm the diagnosis (46).

Avoid diabetes and other long-term health issues after COVID: Researchers don't know why some people develop long-term health issues and others don't (38,41). But early treatment for COVID can help lower the chances of long-term problems. This is especially true for people who are at high risk (42).

If you get a COVID diagnosis, talk with your healthcare provider as soon as possible. They can help you figure out which treatment is best for you (50). And this may even help lower the chance of long-term issues like diabetes.

Being aware of the link between COVID and diabetes can also help you watch for early signs of diabetes (47). If you had a recent COVID diagnosis (especially if you were hospitalized) (48), talk with your healthcare provider if you develop (50):

- Frequent thirst and drinking
- Frequent peeing
- Blurry vision
- Sleepiness
- Weight loss
- Nausea, vomiting, or stomach pain

2.3 Diabetes Mellitus (DM)

Diabetes mellitus (DM) also known as simply diabetes, is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period This high blood sugar produces the symptoms of frequent urination, increased thirst, and increased hunger. Untreated, diabetes can cause many complications (52).

Acute complications include diabetic ketoacidosis and nonketotic hyperosmolar coma.

Serious long-term complications include heart disease, stroke, kidney failure, foot ulcers and damage to the eyes.

Diabetes is due to either the pancreas not producing enough insulin, or the cells of the body not responding properly to the insulin produced. There are three main types of diabetes mellitus:

Type 1 DM: results from the body's failure to produce enough insulin. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes" (53). The cause is unknown.

Type 2 DM: begins with insulin resistance, a condition in which cells fail to respond to insulin properly. As the disease progresses a lack of insulin may also develop. This form was previously referred to as "non-insulin-dependent diabetes mellitus" (54) (NIDDM) or "adult-onset diabetes". The primary cause is excessive body weight and not enough exercise.

Gestational diabetes: is the third main form and occurs when pregnant women without a previous history of diabetes develop a high blood glucose level (52).

Prevention and treatment involves a healthy diet, physical exercise, not using tobacco, and being a normal body weight (54). Blood pressure control and proper foot care are also important for people with the disease. Type 1 diabetes must be managed with insulin injections. Type 2 diabetes may be treated with medications with or without insulin.

Insulin and some oral medications can cause low blood sugar. Weight loss surgery in those with obesity is an effective measure in those with type 2 DM. Gestational diabetes usually resolves after the birth of the baby.

Signs and symptoms: The classic symptoms of untreated diabetes are weight loss, polyuria (frequent urination), polydipsia (increased thirst), and polyphagia (increased hunger) (52).

Symptoms may develop rapidly (weeks or months) in type usually develop much more slowly and may be subtle or absent in type Several other signs and symptoms can mark the onset of diabetes, a not specific to the disease. In addition to the known ones above, they include blurry vision, headache, fatigue, slow healing of cuts, and itchy skin. Prolonged high blood glucose can cause glucose absorption in the lens of the eye, which its shape, resulting in vision changes. A number of skin rashes that can occur in diabetes are collectively known as Diabetic emergencies People (usually with type 1 diabetes) may also experience episodes of ketoacidosis, a type of metabolic problems characterized by abdominal pain, the smell of Kussmaul breathing, and in severe cases a decreased level of consciousness. (53) A rare but equally severe possibility is common in type 2 diabetes and is mainly the result of dehydration (55).

In addition to the known ones above, they include blurry vision, headache, fatigue, slow healing of cuts, and itchy skin. Prolonged high blood glucose can cause glucose absorption in the lens of the eye, which leads to changes in its shape, resulting in vision changes. A number of skin rashes that can occur in diabetes are collectively known as diabetic dermadromes.

Diabetic emergencies: People (usually with type 1 diabetes) may also experience episodes of ketoacidosis, a type of metabolic problems characterized by abdominal pain, the smell of Kussmaul breathing (53), and in severe cases a decreased level of consciousness. A rare but equally severe possibility is common in type 2 diabetes and is mainly the result of dehydration.

Complications: All forms of diabetes increase the risk of long develop after many years otherwise not received a diagnosis before that time. Symptoms may develop rapidly (weeks or months) in type 1 diabetes, while they usually develop much more slowly and may be subtle or absent in type 2 diabetes.

Several other signs and symptoms can mark the onset of diabetes, although they are not specific to the disease. In addition to the known ones above, they include blurry vision (52), headache, fatigue, slow healing of cuts, and itchy skin. Prolonged high blood glucose can cause glucose absorption in the lens of the eye, which leads to changes in its shape, resulting in vision changes.

A number of skin rashes that can occur in diabetes are collectively known as diabetic dermadromes. 1 diabetes may also experience episodes of diabetic a type of metabolic problems characterized by nausea, vomiting and the smell of acetone on the breath, deep breathing known as and in severe cases a decreased level of consciousness.

A rare but equally severe possibility is hyperosmolar nonketotic state, which is more 2 diabetes and is mainly the result of dehydration.

All forms of diabetes increase the risk of long-term complications. These typically lop after many years (10–20), but may be the first symptom in those who have otherwise not received a diagnosis before that time.

The major long-term complications relate to damage to blood vessels. Diabetes doubles the risk of cardiovascular disease and about 75% of deaths in diabetics are due to coronary artery disease. Other "macrovascular" (52) diseases are stroke, and peripheral vascular disease.

The primary microvascular complications of diabetes include damage to the eyes, kidneys, and nerves. Damage to the eyes, known as diabetic retinopathy, is caused by damage to the blood vessels in the retina of the eye, and can result in gradual vision loss and potentially blindness.

Damage to the kidneys, known as diabetic nephropathy, can lead to tissue scarring, urine protein loss, and eventually chronic kidney disease, sometimes requiring dialysis or kidney transplant Damage to the nerves of the body, known as diabetic neuropathy is the most common complication of diabetes (55).

The symptoms can include numbness, tingling, pain, and altered pain sensation, which can lead to damage to the skin. Diabetes-related foot problems (such as diabetic foot ulcers) may occur, and can be difficult to treat, occasionally requiring amputation. Additionally, proximal diabetic neuropathy causes painful muscle wasting and weakness.

There is a link between cognitive deficit and diabetes. Compared to those without diabetes, those with the disease have a 1.2 to 1.5-fold greater rate of decline in cognitive function.

Causes: Diabetes mellitus is classified into four broad categories: type 1, type 2, gestational diabetes, and "other specific types (52). The "other specific types" are a collection of a few dozen individual causes. The term "diabetes", without qualification, usually refers to diabetes mellitus.

Type 1: Type 1 diabetes mellitus is characterized by loss of the insulin the islets of Langerhans in the pancreas, leading to insulin deficiency. This type can be further classified as immune diabetes is of the immune-mediated nature, in which a attack leads to the loss of beta cells and thus insulin of diabetes mellitus cases in North America otherwise healthy and of a healthy weight when onset occurs. Sensitivity and responsiveness to insulin are usually normal, especially in the early stages.

Type diabetes can affect children or adults, but was trade because a majority of these diabetes cases were in children.

"Brittle" diabetes, also known as unstable diabetes or labile diabetes, is a term that was traditionally used to describe the dramatic and recurrent swings in often occurring for no apparent reason in however, has no biologic basis accompanied by irregular and unpredictable and sometimes with serious hypoglycemia counter regulatory response to hypoglycemia, infection, erratic absorption of dietary carbohydrates), and endocrinopathies (e.g., disease) (52). These phenomena are believed to occur no more frequently than in 1% to 2% of persons with type 1 diabetes.

Type 1 diabetes is partly inherited, with multiple gen genotypes, known to influence the risk of diabetes. In genetically susceptible people, the onset of diabetes can be triggered by one or more environmental factors, such as a viral infection or diet. There is some evidence that suggests an association between type 1 diabetes and Coxsackie B4 virus diabetes is unrelated to lifestyle.

1 diabetes mellitus is characterized by loss of the insulin-producing beta cells in the pancreas, leading to insulin deficiency.

This type can be further classified as immune-mediated or idiopathic. The majority of type mediated nature, in which a T-cell-mediated autoimmune attack leads to the loss of beta cells and thus insulin (54) It causes approximately 10% of diabetes mellitus cases in North America and Europe. Most affected people are otherwise healthy and of a healthy weight when onset occurs. Sensitivity and responsiveness to insulin are usually normal, especially in the early stages. Type diabetes can affect children or adults, but was traditionally termed "juvenile diabetes" because a majority of these diabetes cases were in children.

"Brittle" diabetes, also known as unstable diabetes or labile diabetes, is a term that was traditionally used to describe the dramatic and recurrent swings in glucose often occurring for no apparent reason in insulin-dependent diabetes. This term, however, has no biologic basis and should not be used (52). Still, type 1 diabetes can be accompanied by irregular and unpredictable hyperglycemia, frequently with hypoglycemia.

Other complications include an impaired counter regulatory response to hypoglycemia, infection, gastroparesis (which leads to erratic absorption of dietary carbohydrates), and endocrinopathies (e.g., Addison's These phenomena are believed to occur no more frequently than in 1% to

1 diabetes (52). Diabetes is partly inherited, with multiple genes, including certain HLA, known to influence the risk of diabetes. In genetically susceptible people, of diabetes can be triggered by one or more environmental factors, such as a viral infection or diet.

There is some evidence that suggests an association between Coxsackie B4 virus. Unlike type 2 diabetes, the onset of type diabetes is unrelated to lifestyle. beta cells of in the pancreas, leading to insulin deficiency.

This type can mediate or idiopathic. The majority of type 1 autoimmune It causes approximately 10% ica and Europe. Most affected people are otherwise healthy and of a healthy weight when onset occurs. Sensitivity and responsiveness to insulin are usually normal, especially in the early stages. Type 1 tonally termed "juvenile diabetes" "Brittle" diabetes, also known as unstable diabetes or labile diabetes, is a term that glucose levels, dependent diabetes. This term, 1 diabetes can be, frequently with ketosis, impaired (which leads to Addison's These phenomena are believed to occur no more frequently than in 1% to HLA, known to influence the risk of diabetes. In genetically susceptible people, of diabetes can be triggered by one or more environmental factors, such as a viral infection or diet. There is some evidence that suggests an association between. Unlike type 2 diabetes, the onset of type 1 diabetes is unrelated to lifestyle.

Type 2: Type 2 diabetes mellitus is characterized by insulin resistance, which may be combined with relatively reduced insulin secretion (55). The defective responsiveness of body tissues to insulin is believed to involve the insulin receptor. However, the specific defects are not known. Diabetes mellitus cases due to a known defect are classified separately. Type 2 diabetes is the most common type.

In the early stage of type 2, the predominant abnormality is reduced insulin sensitivity. At this stage (53), hyperglycemia can be reversed by a variety of measures and medications that improve insulin sensitivity or reduce glucose production by the liver. Type 2 diabetes is due primarily to lifestyle factors and genetics (52).

A number of lifestyle factors are known to be important to the development of type 2 diabetes, including obesity (defined by a body mass index of greater than thirty), lack of physical activity, poor diet, stress, and urbanization.

(54) Excess body fat is associated with 30% of cases in those of Chinese and Japanese descent, 60-80% of cases in those of European and African scent, and 100% of Pima Indians and Pacific Islanders (55).

Those who are not obese often have a high waist–hip ratio (55). Dietary factors also influence the risk of developing type 2 diabetes. Consumption of sugar-sweetened drinks in excess is associated with an increased risk (54) (55) The type of fats in the diet is also important, with saturated fats and trans fatty acids increasing the risk and polyunsaturated and monounsaturated fat decreasing the risk (52). Eating lots of white rice appears to also play a role in increasing risk (56) A lack of exercise is believed to cause 7% of cases (53).

Gestational diabetes: Gestational diabetes mellitus (GDM) resembles type 2 diabetes in several respects, involving a combination of relatively inadequate insulin secretion and responsiveness. It occurs in about 2-10% of all pregnancies and may improve or disappear after delivery (52) However, after pregnancy approximately 5-10% of women with gestational diabetes are found to have diabetes mellitus, most commonly type 2 (53). Gestational diabetes is fully treatable, but requires careful medical supervision throughout the pregnancy (55). Management may include dietary changes, blood glucose monitoring, and in some cases insulin may be required. Though it may be transient, untreated gestational diabetes can damage the health of the fetus or mother. Risks to the baby include macrosomia (high birth weight), (56) congenital cardiac and central nervous system anomalies, and skeletal muscle malformations. Increased fetal insulin may inhibit fetal surfactant production and cause respiratory distress syndrome. Hyperbilirubinemia may result from red blood cell destruction. In severe cases, perinatal death may occur, most commonly as a result of poor placental perfusion due to vascular impairment. Labor induction may be indicated with decreased placental function (56) A Caesarean section may be performed if there is marked fetal distress or an increased risk of injury associated with macrosomia, such as shoulder dystocia.

2.4. Test

2.4.1. Polymerase Chain Reaction (PCR)

Polymerase chain reaction (PCR) is a powerful core molecular biology technique that is an efficient and rapid in vitro method for enzymatic amplification of specific DNA or RNA sequences from various sources. A standard PCR consists of target DNA, a set of synthetic

oligonucleotide primers that flank the target DNA sequence, a thermostable DNA polymerase (usually Taq polymerase), and nucleotides. Using thermal cyclers, there are three stages during each amplification cycle, including denaturing double-stranded DNA (dsDNA) into separate single stranded DNA, annealing primers to the target DNA sequence, and extension, where DNA polymerase extends the DNA from the primers, creating new dsDNA with one old strand and one new strand. The strands synthesized in one cycle serve as a template in the next, resulting in a million-fold increase in the amount of DNA in just 20 cycles.

2.4.2. RNA Extraction

In a rotisserie shaker, the blood sample is mixed for at least 10 minutes at room temperature. The blood must completely thaw if it is frozen before being mixed for ten minutes.

- Fill a 1.5ml micro-centrifuge tube with 20 µl of Proteinase K (PK) Solution.
- We briefly mix 200 µl of blood with the Proteinase K (PK) Solution in the tube.
- Fill the Tube with 200 µl of Cell Lysis Buffer (CLD), cap it, and vortex for at least 10 seconds

Note: To get good yields, this vortexing phase is required.

- The following step consisted to incubate for 10 minutes at 56°C.W
- A Binding Column needs to be put in an empty Collection Tube while the blood sample is incubating.
- Erase the tube from the block heater and add 250 µl of Binding Buffer (BBA), cap the tube, and mix with a vortex mixer for 10 seconds.

Note: To get good yields, this vortexing phase is required.

- Fill the Binding Column with the contents of the tube, cap it, and place it in a micro-centrifuge.
- Check the bound column to see if the lysate fully traversed the membrane after samples were centrifuged at full speed for 1 minute. If the lysate is still visible on top of the membrane, continue centrifuging for another minute.

Note: If desired, a slower speed can be used to centrifuge the sample.

- We extend the centrifugation time accordingly to ensure that the lysate has fully traversed the membrane.

- We now remove the flow-through collection tube and dispose of the liquid as hazardous waste.

- In this stage, the binding column is placed in a new collecting tube together with 500 µl of Column Wash Solution (CWD). The column is then centrifuged for three minutes at top speed while the flow through is removed.

Note: We centrifuge the column for an additional minute if any of the wash solution is still on the membrane.

- For a total of three washes, repeat Step 11 twice more.

- In this step, put the column in a clean 1.5 ml micro-centrifuge tube.

- Fill the column with 50–200 µl of Nuclease-Free Water and centrifuge for 1 minute at top speed.

Note: Eluting in 50 µl dramatically rises the intensity of DNA while lowering yield by 25-30%

- We discard the bound Column and save the eluate in the final step. Binding columns and collection tubes should not be reused.

2.4.3. Amplification by PCR

Add the following step to the PCR tube: 39 µl of PCR Premix plus 5µl each of primers, taq, and 5µl of DNA (50 ng). Place the tubes into the cycler (PCR Real time for amplification), amplify DNA using the following protocol, and then add 1 drop of Nujol oil to each PCR reaction as needed:

- (96 ºC/5min)
- 25 cycles of:
- (96 ºC/ 30 sec)
- (57 ºC/60 sec)
- (72 ºC/60 sec)
- (72 ºC /5 min, 4 ºC

- PCR amplification
- Detection of Covid-19 DNA

2.4.4. Mini Vidase & Cobuse c311 & Spinreact

- Mini Vidas is a compact automated immunoassay system based on the Enzyme Linked Fluorescent Assay (ELFA) principles. user-friendly, it provides accurate on-demand test results.

- The cobas c 311 analyzer is a stand-alone system that offers consolidated testing from a broad menu of clinical chemistry application.

- Spinreact is a clinical chemistry analyzer that can perform up to 100 tests per hour, or 150 tests per hour when supplied with the optional ISE unit.

- The analyzer comes complete with a cuvette washing and drying function, and also features a continuous sample loading capability. A bar code reader is available as an option.

3. MATERIAL AND METHODS

We took blood samples from patients infected with the Corona virus who were sleeping in the quarantine hospital in the city (Ramadi - Anbar Governorate in Iraq). The period of study was from (1st of February 2022) to (1st of August, 2022). Blood Sample (5ml) was drawn from all patients in the study. We made biochemical test of blood samples after isolation, such as kidney function, liver function, lipids, and measurement of glucose and cumulative sugar for infected patients. Before the specialist doctor and after giving these doses of treatment as well, in order to know the extent of the effect of the treatment on the virus in positive and negative terms and vital body functions, as well as its impact on the percentage of low and high blood sugar levels in patients infected with the virus who have diabetes before infection with the virus and those who are infected with the virus and do not have an infection Diabetes, where some negative and positive effects were observed on the cases from the groups that were divided Previously, in terms of high and low blood sugar level for people infected with the virus and have diabetes, and those infected with the virus and do not have diabetes, and the changes that occurred in the biological (biochemical) reactions in laboratory tests conducted on infected cases.

Where it was been noticed that there are groups of cases who were infected with the virus and they were originally diabetic before infection with the virus, a defect and irregularity in the low and high level of their sugar during infection, before, and after they were given treatment. Cases infected with Covid-19 and not previously infected with diabetes were also noted, as there are Those who had negative and positive effects through high and low blood sugar levels and during infection before and after giving them treatment, and also changes were observed in the vital reactions of some members of the body in the groups of all affected cases.

3.1. Study Period

1) 130 people (54 female and 54 mal) with different grades of illness efficacy with a monitoring set (22 female and male). Covid 19, HbA1c and fasting blood glucose (FBG) (GLU) will been measured in 108 patients.

2) We will work in four groups:

I. Group 1: is a control group (22 people).

II. Group 2: beneficiary patients from treatment (28 people).

III. Group 3: non-beneficiary patients from treatment (28 people).

IV. Group 4: abnormal patients (52 people).

3.2. Statistical Analysis

We used the program to calculate the value of statistical significance, we used the application of the statistical program SAS, where the value of statistical significance was less than 0.02 ($p < 0.02$), and we also used the LSD test (analyses of Differences ANOVA) to make important comparisons between the standard deviations of the values and their averages.

3.3. Instruments and Equipment

Table 3.1. Instruments and equipment

No	Instruments / Equipment	Company	Country
1	Vortex	IKA	Germany
2	Incubator	Memert	Germany
3	Uv Light transiluminator	Ultra Voilet Product institute	USA
4	Water Bath	Klostermann	Germany
5	Pcr Cabient	Anlytik	Germany
6	Micrpipette(10,100,200,1000)µl	Slamed	Japan
7	Freezer (-20c)	Froilabo	France
8	Refrigerator	LG	Korea
9	Printer	Epson	Indonnesia
10	Cooling Boxes		China
11	Plane Tube Blue & Yellow Tips		Jordan
12	Vacuum Tube (EDTA Tube)		
13	Gel &Clot activator Tube		
14	Eppendorf tubes (500 µl)		
15	Gloves	Pro vi	Malaysia
16	Masks		China
17	Stop Watch		China
18	Ethanol 68.6% & methanol 3.7%	Areej	UAE
19	Torniquet		China

4. FINDINGS AND DISCUSSION

Our research included about 130 people (54 female and 54 mal) with different grades for illness levels with a monitoring set (22 female and male). Covid-19, HbA1c and GLU will been measured in 130 people (108 patients and 22 healthy individuals).

With regards into group 2 (beneficiary patients, 28 subject) their (mean ± SEM) of fasting blood sugars were (214.63 ± 100.28, 166.58 ± 50.70 & 134.10 ± 35.51) as compared to control group1 (G1) (88.7 ±9.43) respectively (Table 4.1.), as explained in Figure 4.1.

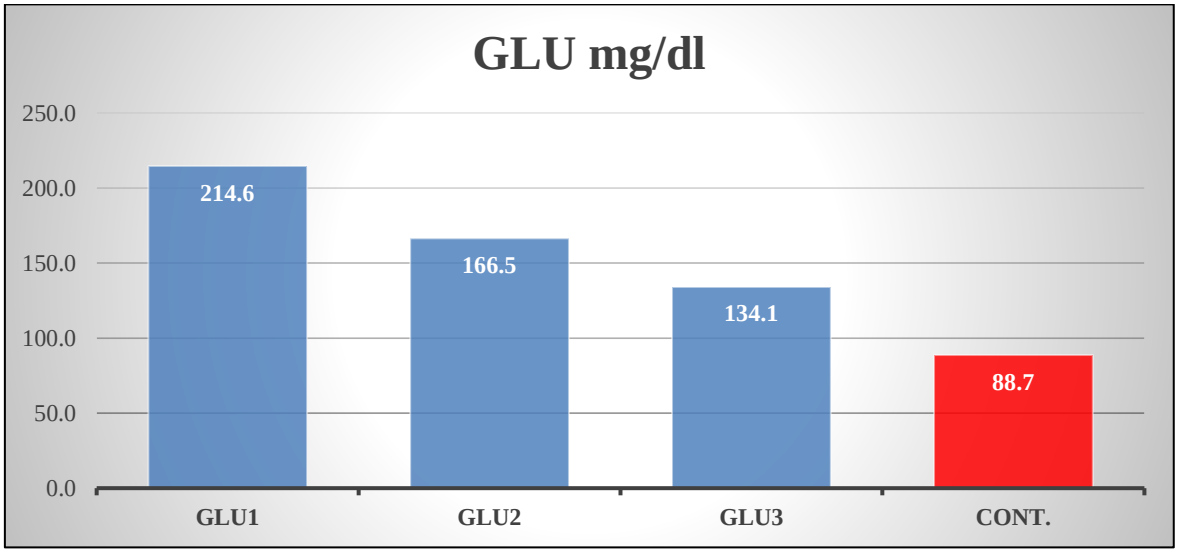

Figure 4.1. Each value represents the mean ± S.E.M of GLU1, GLU2 and GLU3 of beneficiary group (G2) as compared to control group1 (G1) respectively.

The study and biochemical tests were conducted on (4) groups of cases, which were divided as follows:

1- A control group consisting of (22) people. This group is healthy and not infected with the virus covid-19, diabetes or other diseases, as the purpose of this group is to measure and estimate the differences in the tests that took place between it and other infected groups.

The remaining three groups are all infected with the Corona virus -19 and diabetes, and their diabetes differs in some cases, as either he has blood sugar before contracting Covid-19, or he develops it during treatment from Covid-19, or he develops diabetes after gaining recovery from the virus.

2- The group benefiting from the treatment is the group of infected cases that gained recovery from the virus after treatment and did not have negative side effects or permanent chronic diseases such as diabetes.

3- The group that did not benefit from the treatment is the group of infected cases that did not recover from the fissures after giving them the treatment, but rather had negative side effects and chronic diseases (diabetes). As a result of high sugar levels or because of the virus.

4- The abnormal (unnatural) group is a group of infected cases whose test results appeared irregularly, meaning that the averages of the statistical results of the tests were unstable in a certain pattern, for example, they are in a state of continuous increase or decrease or normal for the tests as shown in the figure For the statistical results of this group is an for example (GLU (high - low - high - normal - high - low - high).

The tests that were conducted on a daily basis on the infected cases are (daily sugar GLU - kidney, liver functions and lipid profile) and the tests were conducted for them at a rate of (3) days.

GLU1 The first day of admission to the hospital, the first test and before treatment, and the second and third examinations GLU2, GLU3 in after treatment, the cumulative glucose test (HbA1c) was also conducted on all infected cases, at a rate of (3) tests during a period of time of (6) months. Every two months, an (HbA1c) test is performed.

HbA1c1 is the first test for the infected case during her first admission to the hospital and before treatment, And the tests HbA1c2, HbA1c3 every two months and after treatment.

In addition, HbA1c values of group 2 (beneficiary patients, 28 subject) their (mean ± SEM) were (10.10 ± 0.21, 8.30 ± 0.29 & 6.80 ± 0.31) (Table 4.2.) as compared to control group1 (G1) (4.60 ± 0.43) respectively, as showed in Figure 4.2.

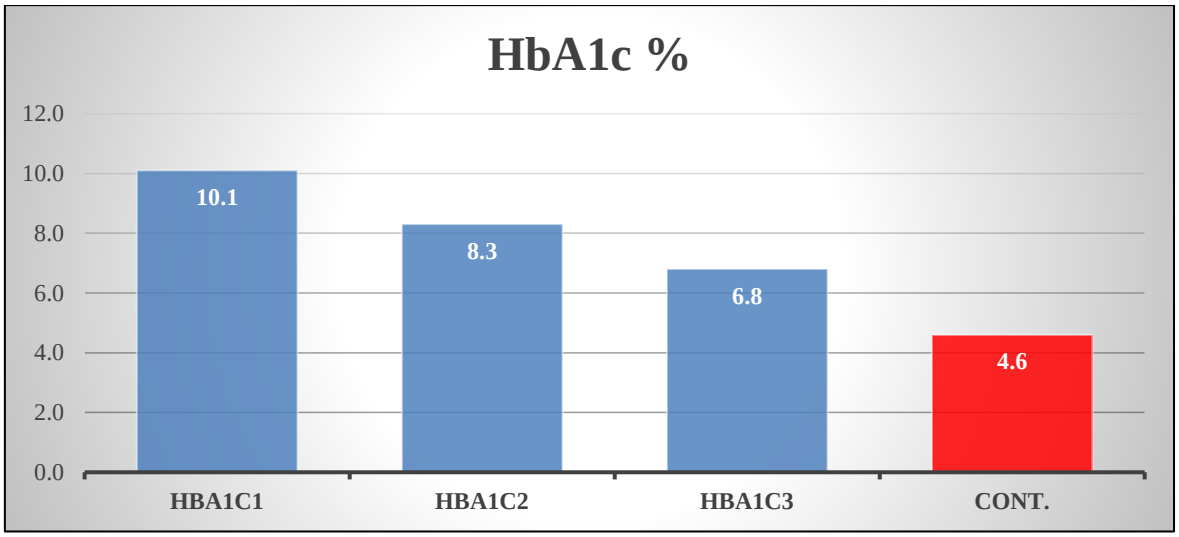

Figure 4.2. Each value represents the mean ± S.E.M of HbA1c values (1, 2 &3) of beneficiary group2 (G2) as compared to control group1 (G1) respectively

Moreover, group 3 (non-beneficiary patients, 28 subject) their (mean ± SEM) of fasting blood sugars (mg/dl) were (175.80 ± 60.38, 215.10 ± 95.73 268.40 ± 135.51) as compared to control group1 (G1) (88.7 ± 9.43) respectively, as noticed in Figure 4.3.

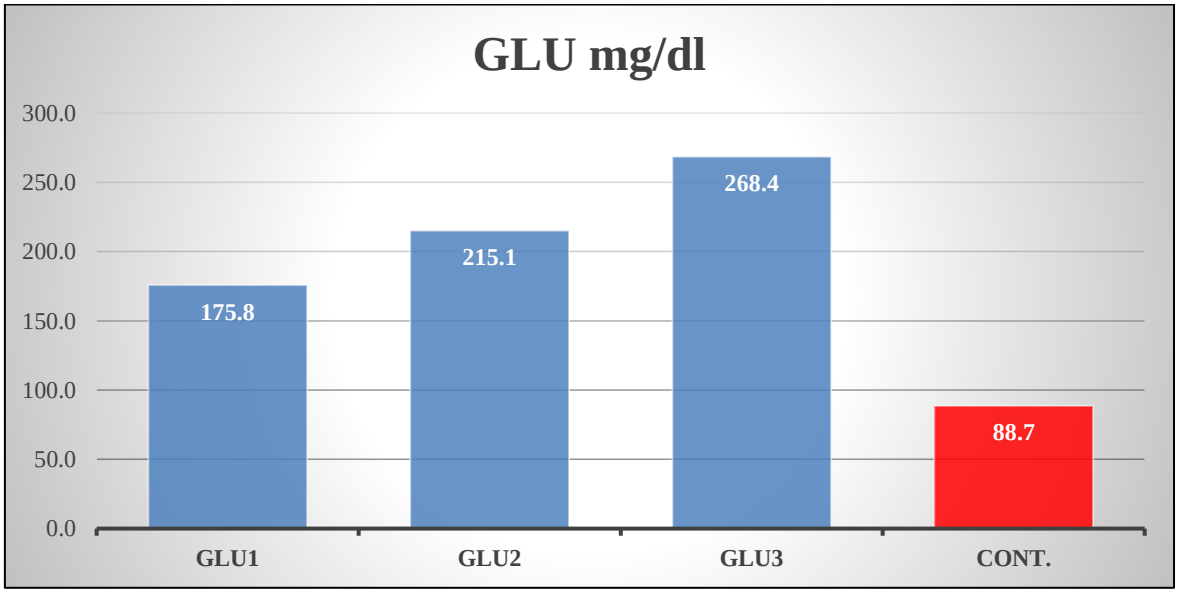

Figure 4.3. Each value represents the mean ± S.E.M of GLU1, GLU2 and GLU3 of non-beneficiary group (G3) as compared to control group1 (G1) respectively.

HbA1c values of group3 (non-beneficiary patients, 28 subject) their (mean ± SEM) were (7.60 ± 0.33, 9.60 ± 0.23 & 12.20 ± 0.21) as compared to control group1 (G1) (4.60 ± 0.43) respectively, as showed in Figure 4.4.

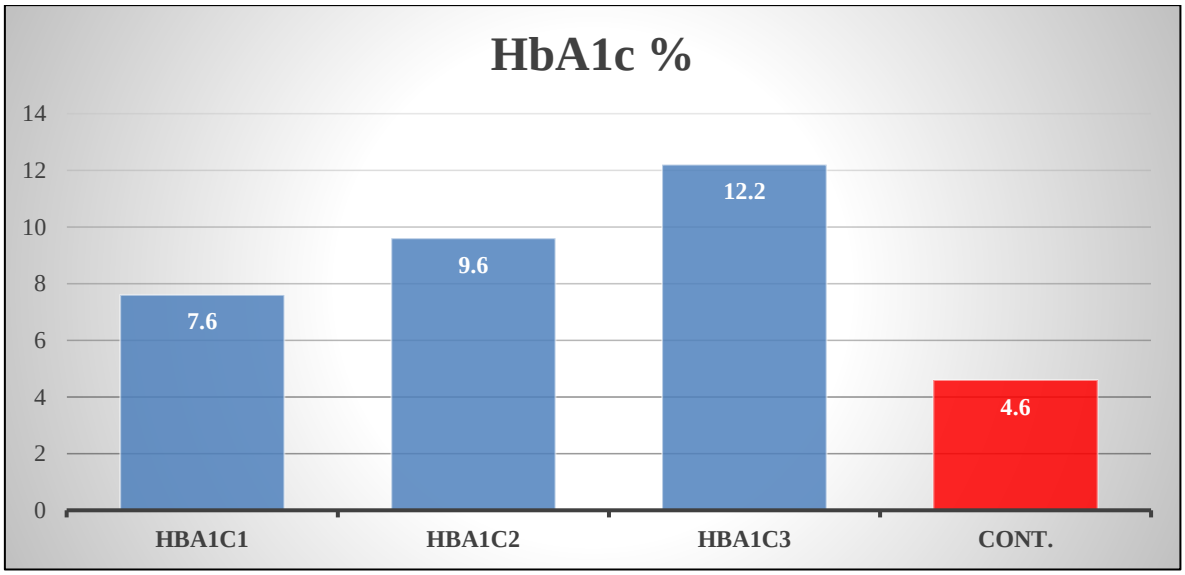

Figure 4.4. Each value represents the mean ± S.E.M of HbA1c values (1,2 &3) of non-beneficiary group3 (G3) as compared to control group1 (G1) respectively.

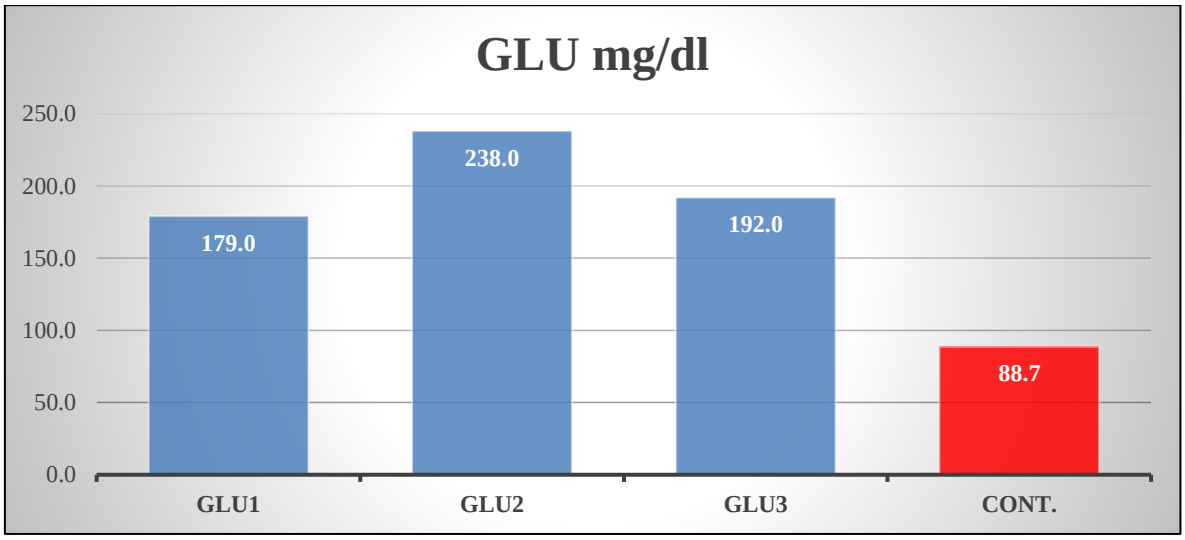

Figure 4.5. Each value represents the mean ± S.E.M of GLU1, GLU2 and GLU3 of abnormal group 4 (G4) as compared to control group1 (G1) respectively.

HbA1c values of group4 (abnormal patients, 52 subject) their (mean ± SEM) were (7.90 ± 0.31, 10.70 ± 0.20 & 8.70 ± 0.31) as compared to control group1 (G1) (4.60 ± 0.43) respectively, as showed in Figure 4.6.

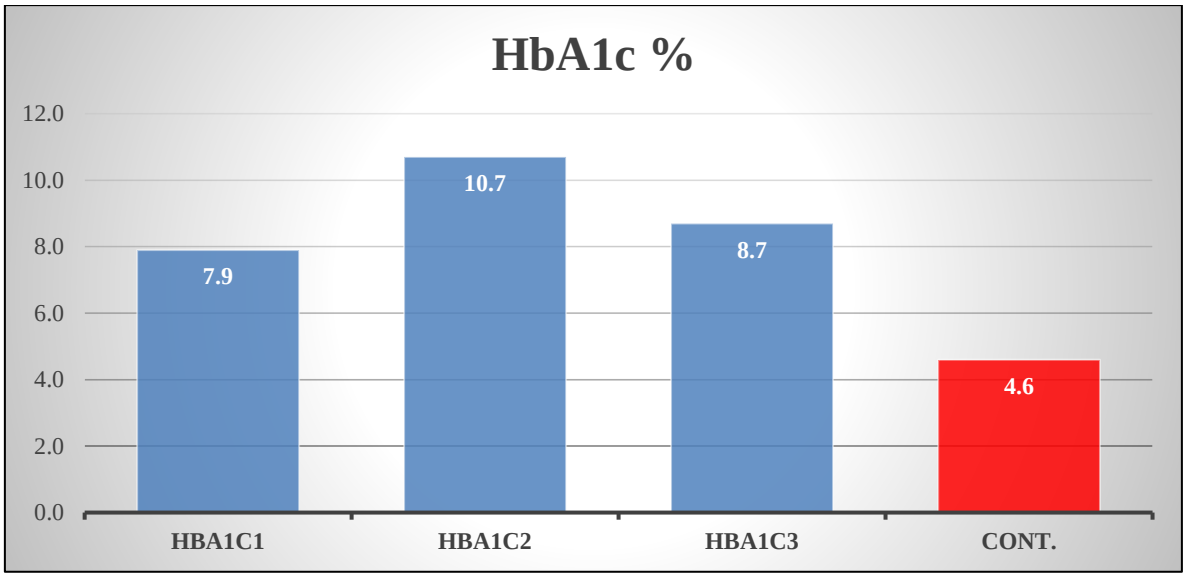

Figure 4.6. Each value represents the mean ± S.E.M of HbA1c values (1, 2 & 3) of abnormal group4 (G4) as compared to control group1 (G1) respectively.

With regards into group 4 (abnormal patients, 52 subject) their (mean ± SEM) of GLU (mg/dl) were (179.0 ± 62.18, 238.10 ± 115.43 & 192.0 ± 86.91) as compared to control group1 (G1) (88.7 ± 9.43) respectively, as explained in Figure 4.5 (Table 4.6).

Table 4.1. Each value represents the mean ± S.E.M of GLU1, GLU2 and GLU3 of beneficiary group (G2) as compared to control group1 (G1) respectively.

GLU mg/dL	Result mg/dL	P Value
GLU1	214.60 ± 100.28	p < 0.02
GLU2	166.58 ± 50.70	p < 0.02
GLU3	134.10 ± 35.51	p < 0.02
CONT.	88.70 ± 9.43	p < 0.02

Table 4.2. Each value represents the mean ± S.E.M of HbA1c values (1, 2 &3) of beneficiary group2 (G2) as compared to control group1 (G1) respectively.

HbA1C %	Result %	P Value
HbA1C1	10.10 ± 0.21	p < 0.03
HbA1C2	8.30 ± 0.29	p < 0.03
HbA1C3	6.80 ± 0.31	p < 0.03
CONT.	4.60 ± 0.43	p < 0.03

Moreover, group 3 (non-beneficiary patients, 28 subject) their (mean ± SEM) of GLU (mg/dl) were (175.80 ± 60.38, 215.10 ± 95.73 268.40 ± 135.51) as compared to control group1 (G1) (88.7 ± 9.43) respectively, as noticed in Table 4.3.

Table 4.3. Each value represents the mean ± S.E.M of GLU1, GLU2 and GLU3 of non-beneficiary group (G3) as compared to control group1 (G1) respectively.

GLU mg/dL	Result mg/dL	P value
GLU1	175.80 ± 95.73	P<0.02
GLU2	215.10 ± 95.73	P<0.02
GLU3	268.40 ± 135.51	P<0.02
CONT.	88.7 ± 9.43	P<0.02

Table 4.4. HbA1c values of group3 (non-beneficiary patients, 28 subject) their (mean ± SEM) were (7.60 ± 0.33, 9.60 ± 0.23 & 12.20 ± 0.21) as compared to control group1 (G1) (4.60 ± 0.43) respectively, as showed.

HbA1C %	Result %	P value
HbA1C1	7.60±0.33	P<0.03
HbA1C2	9.60±0.23	P<0.03
HbA1C3	12.20±0.21	P<0.03
CONT	4.60±0.43	P<0.03

Their (mean ± SEM) were (7.60 ± 0.33, 9.60 ± 0.23 & 12.20 ± 0.21) as compared to control group1 (G1) (4.60 ± 0.43) respectively, as showed in Table 4.4.

Table 4.5. Each value represents the mean ± S.E.M of GLU1, GLU2 and GLU3 of abnormal group 4 (G4) as compared to control group1 (G1) respectively.

GLU mg/dL	Result mg/dL	P value
GLU1	179.00 ± 62.18	P<0.02
GLU2	238.10 ± 115.43	P<0.02
GLU3	192.00 ± 86.91	P<0.02
CONT.	88.7 ± 9.43	P<0.02

With regards into group 4 (abnormal patients, 52 subject) their (mean ± SEM) of GLU (mg/dl) were (179.0 ± 62.18, 238.10 ± 115.43 & 192.0 ± 86.91) as compared to control group1 (G1) (88.7 ± 9.43) respectively, as explained in Table 4.5.

Table 4.6. HbA1c values of group 4 (abnormal patients, 52 subject) their (mean ± SEM) were (7.90 ± 0.31, 10.70 ± 0.20 & 8.70 ± 0.31) as compared to control group1 (G1) (4.60 ± 0.43) respectively

HbA1C %	Result %	P value
HbA1C1	7.90 ± 0.31	P<0.03
HbA1C2	10.70 ± 0.20	P<0.03
HbA1C3	8.70 ± 0.31	P<0.03
CONT	4.60 ± 0.43	P<0.03

The 3rd largest reason to die in the world is Diabetic which is responsible for a much multiple, affecting on different organs in the body (16). Until yet, a body of evidence indicates that an increased risk of contracting the SARS-2 virus has a strong relationship with diabetes (17,18).

A positive relationship was found between high blood sugar and acute infection with the Covid-2 virus. Our investigations also indicated that there is a positive relationship between the HbA1c level and the severity of infection with the virus and these results were identical with the recently studied where by observing the high death rate for diabetics after their acute infection with the virus, as well as the death rate was high in those infected with the virus and non-diabetes, which their fasting glucose value is above average (pre-diabetic patent) (19).

In addition, in our research, we examined the severity of infection with the virus for patients and the percentage of diabetes in the blood of those with severe infection with the virus, and we found that it was very high (the level of glucose in the serum > 140 mg / dl) (20).

Furthermore, most of those infected with the virus died shortly after entering the quarantine hospital and giving him the necessary treatments, about 75% of them, and one of the most important of these reasons was the significant increase in blood sugar levels, even if the patient did not have diabetes, but all patients were infected with the SARS epidemic virus, and this is what confirmed by some recent research on the virus and diabetes (19). Also, our study showed that the patients showed three groups, a group of beneficiaries of the treatments, and they constitute 25%, and another group that does not benefit from the treatments, and they make up 25%, and another group that is abnormal, which constitutes 50%.

In other words, we noticed that those with acute infection with the virus have an important increase in the level of diabetes in the blood, and we see it clearly in patients with diabetes or patients who are predisposed to diabetes (pre-diabetes) or / and patients who have an increase in obesity. Also, for patients with type 2 diabetes and obesity, their inflammatory changes will lead to a change in cytokines and chemokines, and this in turn leads to activation of leukocytes, increased fibrosis and programmed cell death, and then an increase in the proportion of inflammatory cytokines (21).

5. CONCLUSION AND RECOMMENDATIONS

We conclude from this study that the effects of the Corona virus on the immunity of the human body do not affect the respiratory system only, but also affect people with chronic diseases such as diabetes, heart disease and other diseases, and this virus may cause death for patients who suffer from weak immunity due to these diseases. Especially diabetes, as some changes can occur during the blood sugar level in terms of its rise and fall in the blood of those who had diabetes before infection with the Corona virus, during infection, and after recovery. These changes were noticeable on the cases and clear in terms of clinical and laboratory results, both positive and negative.

High blood sugar appears to exacerbate infection more in non-diabetic Covid-19 patients than in Covid-19 diabetic patients.

And through this study and the examinations that we conducted for these cases, all of whom are infected with the Corona virus, some of them have diabetes, and some of them do not have diabetes, as it became clear to us after giving them the treatment

The treatment protocol is:

- Decadron: Dexamethasone 8 mg
- Hydrocortisone suspension 100 mg
- prednisolone 5 mg pills

Where this group of treatments is considered an inhibitor of the immune response of the body and pain, shortness of breath and respiratory problems, but as we know that cortisone types have many side effects on patients with heart, arteries and diabetes, so it raises the blood sugar rate of the patient and irregularity in the levels of rise and fall of blood sugar in the patient

Which is used by most countries to treat Covid-19 before the vaccine was found, so it became clear to us that blood sugar levels were irregular in all patients. For those who did not have diabetes, some of them had increased and some of them did not, and those infected and had blood diabetes, some of them died, and some who were cured of the virus came out with a chronic disease, which is blood sugar with Knowing that patients whose blood sugar level has increased or decreased have been given units of insulin as needed and under the

supervision of the specialist doctor and in quantities ranging from 10 insulin units to 25 or 30 insulin units, according to the needs of the affected case and who has a defect in the rate of high and low blood sugar.

5.1. Recommendations

- Conducting additional studies on the impact of the therapeutic protocol used in treating cases of COVID-19 infection in terms of quantity and focus on cases infected with COVID-19.

- Conducting additional studies on the effect of the therapeutic protocol used in treating cases of COVID-19 infection in terms of quantity and focus on kidney function for patients infected with COVID-19 virus.

- Conducting additional studies on the effect of the therapeutic protocol used in the treatment of infected Covid-19 cases, in terms of quantity and focus on liver function.

- Conducting additional studies on the effect of the therapeutic protocol used in the treatment of infected Covid-19 cases in terms of quantity and focus on the functions and level of lipids in the blood.

- Conducting a comparative statistical study of the Covid-19 treatment protocol in terms of side effects and mortality.

- Finally, please follow another treatment protocol or improve the protocol used in hospitals so that the percentage of cases benefiting from the new protocol increases and the percentage of its side effects on them decreases.

6. REFERENCE

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7. CURRICULUM VITAE

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Makale ve Bildiriler
Fawaz MOM, Aksoy DK, EsraaAbd AL. The effect of the Covid-19 pandemic (Corona Virus) on HbA1c and daily sugar levels on diabetic patients. Eur. Chem. Bull. 2023; 12(3); 721-727.