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The Effect of Blood Group Types on Covid-19 Infection in Diabetic Patients

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Abstract **Background:** A pandemic classification for COVID-19 was later issued. The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was the cause of it. It spreads quickly and can result in severe respiratory failure at an early stage. Clinical research has demonstrated that the risk of infection is increased by both aging and chronic conditions. As such, blood group effects on the COVID-19 infection and its progression remain unknown. **Aim:** This study investigates possible relationships between patient blood group types, risk of SARS-CoV-2 infection, and clinical outcomes in COVID-19 in diabetic patients. **Methodology:** Age (41–60) was shown to be the age group most susceptible to infection with the SARS–COVID–19 virus, according to a statistical analysis of data from 90 individuals infected with COVID-19. Based on gender, the findings indicated that women had a greater incidence of diabetes than men did, with women having a 46% incidence of diabetes and men having a 44% infection rate. The blood types A and O were the most prevalent. According to the results of the current investigation, blood type O+ individuals had a higher prevalence of diabetes than blood type O-individuals. Based on gender, the findings indicated that women had a greater incidence of diabetes than men did, with women having a 46% incidence of diabetes and men having a 44% infection rate. **Results:** The results of the present study suggest that while blood group A might have a role in increased susceptibility to COVID-19 infection, blood group O might be somewhat protective. However, blood group type does not seem to influence clinical outcomes once infected.

Key Words blood groups, COVID-19, SARS-COV-2, diabetes militance

1. Introduction

Coronavirus disease 2019 (COVID-19) was caused by coronavirus 2 (SARS-CoV-2). Common indications and symptoms of COVID-19 include fever, dyspnea, and cough. Seasonal upper respiratory tract infections are associated with these [1]. To confirm SARS-CoV-2 infection, exact diagnostic techniques to identify viral nucleic acids, antigens, or serological tests are required. Use magnetic resonance imaging (MRI) or computed tomography (CT) of the chest to confirm illness signs [2], [3]. The potentially fatal acute respiratory distress syndrome (ARDS) is a defining feature of COVID-19. Although the lungs are the main target of the virus, the infection commonly affects the immunological, brain, kidney, liver, and cardiovascular systems [5]. Due to the high COVID-19 morbidity and mortality, social distancing, face masks, contact isolation, hand hygiene, contact tracing, clinical evaluation, and virus testing were implemented to avoid SARS-CoV-2 transmission [4], [5].

Numerous studies have revealed that an individual's co-morbidities, advanced age, and male sex all raise their risk and severity of infection [6]. There isn't yet a unique biological marker that can be used to identify the illness. Blood type and infection risk were shown to be related in a few studies on SARS-CoV-1, and blood group O was found to offer some protection against SARS-CoV-1 [7], [8].

A chronic condition called diabetes is defined by unusually high blood glucose levels brought on by decreased insulin secretion or activity. Globally, more than 425 million people suffer from diabetes [9]. While β-cells that produce insulin are destroyed by the immune system in type 1 diabetes (T1D), insulin resistance and β-cell insulin secretory malfunction cause type 2 diabetes (T2D), which eventually leads to β-cell fatigue and destruction [10], [11]. Diabetes that is not properly managed raises the risk of infections of the skin, bones, eyes, ears, gastrointestinal tract, urinary tract, and respiratory system, among other conditions, with markedly higher rates of hospitalization and death [12], [13].

On the other hand, immunological dysregulation causes

inappropriate pro-inflammatory cytokine release by alveolar macrophages and insufficient type I interferon (IFN) response in certain individuals [14]. It takes a successful type I interferon (IFN) response to prevent viral replication, stop it early in its spread, and trigger an efficient adaptive immune response [15].

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2. Materials and Methods

A. Diabetes Patient population

Collection of specimens: Ninety patients with COVID-19 infection who were monitored at Teaching Baqubah Hospitals between October 3, 2021, and May 5, 2021, were included in the current study. These patients tested positive for SARS-CoV-2 RNA via PCR using a nasopharyngeal swab, and they were contacted regarding the Iraqi Ministry of Health's recommended course of treatment. A retrospective evaluation of the patient's medical records was conducted. Our hospital conducted the blood group analysis on the patients, and the blood group was found.

Because of the established protocol of the Teaching Baqubah Hospital, all ethical issues were adhered to precisely. According to standard treatment practices, all study participants gave informed consent for diagnostic and therapeutic procedures at the time of hospital admission, as attested to by their medical records. The local ethical committee received approval for this study from the Medicine College of Diyala University as requested. Decisions on comorbidities and histories of diabetes mellitus were determined by the specialist physician based on clinical outcomes. The control group was included to determine the typical distribution of the blood types. These patients' blood group distributions, age, and sex were recorded.

B. Working method

1) Blood was drawn from patients with both types of diabetes after recording all the patient's information (the patient's age, the patient's type of diabetes, the patient's sex, whether the patient is vaccinated against COVID-19 or not, the type of vaccine the patient received against Covid-19, and the number of doses. Which the patient received from the vaccine against COVID-19).
2) Draw an amount of blood (2-3 ml) from the study samples according to the method mentioned by Feirstein in 2021.
3) the samples were placed in anticoagulant tubes to use the sample to conduct a blood type test for each patient.
4) The blood group tests were conducted for each patient according to the manufacturer's instructions (Anamol Kit Component (3×10 ml)) First, take a glass side and mark three circles on it after cleaning the slide.
   - Open the kit containing the monoclonal antibodies (MABs). Apply the Anti-A, Anti-B, and Anti-D in the first, second, and third circles, respectively, in a sequential manner using a dropper.
   - Carefully set the slide aside so as not to disturb it.
   - The ring finger needs to be cleaned with alcohol swabs, and the area where the blood sample will be taken needs to be gently rubbed.
   - Using the lancet, puncture the ring fingertip and remove the first drop of blood.
   - Gently press the fingertip on the three circles on the glass slide to let the blood fall on them as it begin to flow.
   - To prevent the blood flow, pressure must be applied to the punctured area. If needed, use the cotton ball.
   - Use a toothpick to gently mix the blood sample, then wait a minute to see the outcome.
5) Conduct a test to confirm the presence of IgG and IgM antibodies in diabetics using serum samples at room temperature. According to the manufacturer's instructions (CTK IgG IgM CTK USA Strip).
6) The positive test result began to appear in the second minute and was confirmed after 10-15 minutes.
7) Recording the results of the tests we conducted and then conducting statistical analysis of them. This is to study the relationship of blood types to Covid-19 infection in diabetics

Age groups	No.	%
≥ 20	2	2.2 %
21-40	16	17.8 %
41-60	55	61.1 %
≤ 60	17	18.9 %
total	90	100

Table 1: The distribution of the COVID-19 infections according to age groups

3. Results and Discussion

When studying the effect of age on 90 people infected with COVID-19, the results of the statistical analysis of the results showed that the age group (41-60) was 55% most vulnerable to infection with the SARS Covid-19 virus, then followed by the group (21-40) with a rate of 16%. As shown in Table 1 and Figure 1.

According to this study, diabetes mellitus is a chronic condition that often affects adults over the age of 40. Due to factors like obesity, sedentary lifestyles, westernized diets, urbanization, and genetic predisposition, its incidence is rising quickly. Numerous co-morbidities and consequences, such as hypertension, retinopathy, and diabetic foot ulcers, have raised the disease's morbidity and mortality as well as its cost of care. This outcome concurs with the findings of Wrapp et al., (2020) [19].

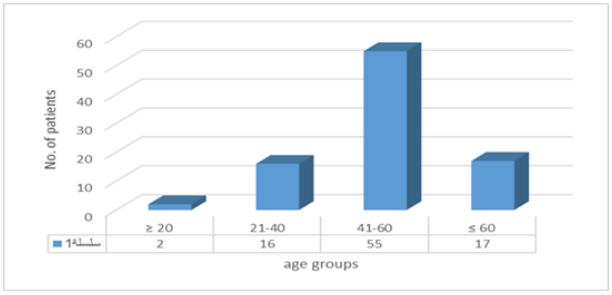

Figure 1: Fig.1: The distribution of the infections with Diabetes mellitus according to age groups among COVID-19 infectious patients

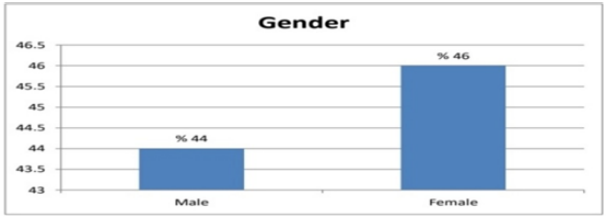

Figure 2: Rates of diabetes according to gender among COVID-19 infectious patients

Based on gender, the findings indicated that women had a greater incidence of diabetes than men did. Figure 2 shows that the incidence of diabetes in women was 46%, while the infection rate in men was 44%.

Our research revealed that type 2 diabetes is far more common than type 1 diabetes, with the prevalence of diabetes among those afflicted being distributed as follows: 11% of people have type 1 diabetes, and 79% of people have type 2 diabetes Figure 3.

Figure 4 shows the ABO distribution in the study population as well as the baseline characteristics of the subpopulations of COVID-19-infected patients defined by blood group. The blood types A and O were the most prevalent. According to the current study, blood type O+ individuals had a higher prevalence of diabetes than blood type O-individuals. The percentage of blood types was divided between COVID-19 carriers and those with diabetes.

The results showed that people with type 2 diabetes and those with blood group type (O+) have a higher percentage

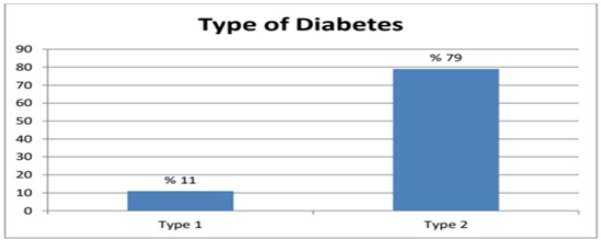

Figure 3: The incidence of type 1 and type 2 diabetes among COVID-19 infectious patients

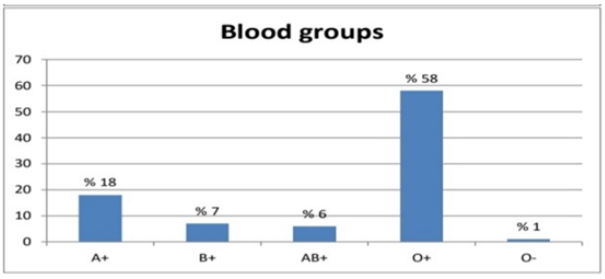

Figure 4: Distribution of blood group ratios for patients with diabetes

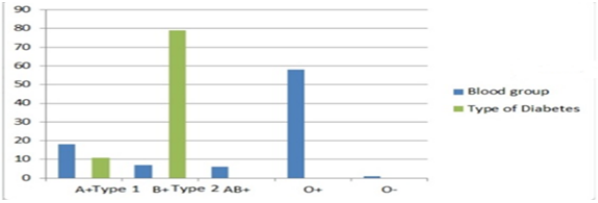

Figure 5: Shows the effect of blood group types on diabetes

of people with type 1 diabetes and are more likely to be infected with the Coronavirus compared to patients with type 1 diabetes who have other blood types and people with (-O) blood group types. are the people least infected with the Coronavirus within the study group, Figure 5.

Through our study, we found that people with type 2 diabetes are the most likely to be infected with the Coronavirus, as they have both IgG and IgM antibodies. This means that the patient was exposed to infection with the Coronavirus in the past and was also exposed to a recent infection, or that he received a vaccine against the Coronavirus. The rate of infection with the second type of diabetes reached 80% compared to the first type, which had a rate of infection of 20%, and the rate of infection with the Coronavirus was 40% through the presence of IgG & IgM antibodies, Figure 5, Figure 6.

Through the study we conducted, we found that the percentage of patients vaccinated against the Coronavirus was small, reaching 32%. In comparison, the rate of patients with diabetes who were not vaccinated reached 58%, Figure 7.

From the results that we obtained within our study and

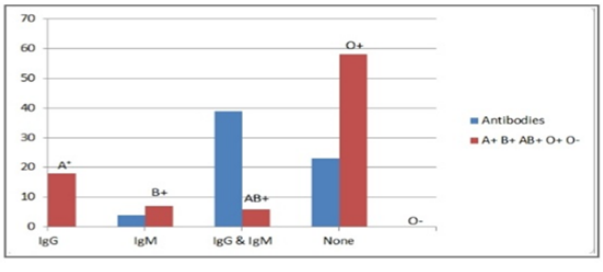

Figure 6: Shows the effect of blood group types on infection with the Coronavirus

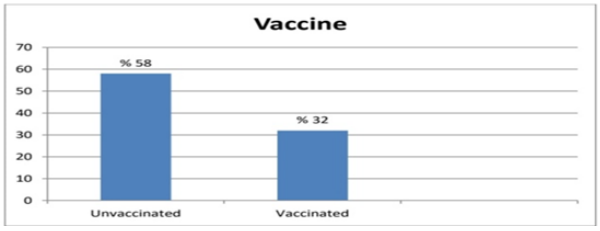

Figure 7: Distribution of the percentage of diabetic patients vaccinated against the Coronavirus and those who are not

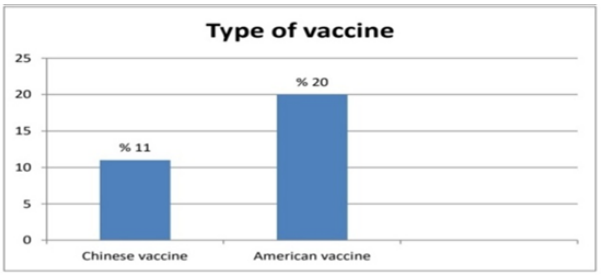

Figure 8: Percentages of patients vaccinated with the American vaccine and the Chinese vaccine

the information that we collected, we found that only 30 people who participated in the research were vaccinated and that the percentage of people vaccinated with the American vaccine was higher than the percentage of those vaccinated with the Chinese vaccine, and the percentage was distributed as follows: The percentage of patients vaccinated with the American vaccine was 20%, while the percentage of patients vaccinated with the Chinese vaccine. It was 11% Figure 8

After we examined the patients immunologically according to the presence of antibodies in diabetic patients, we found that the highest percentage of antibodies in patients was the presence of both IgG & IgM antibodies. While the lowest percentage was the presence of IgM antibodies in people with diabetes, the percentages of presence of antibodies in diabetics were distributed as follows: IgG: 24%. This indicates that the patient was exposed to the Coronavirus approximately 3 months or more ago IgM: 4%. This indicates that the patient was recently exposed to the Coronavirus for a period not exceeding two months or less, or he may have recently been vaccinated against the Coronavirus. IgG & IgM: 39%. This indicates that the patient was exposed to an old infection with the Coronavirus and was exposed to a second infection again. The reason may be attributed to them receiving the vaccine against the Coronavirus as well.

The percentage of people who did not show any type of antibodies was 23%, and this indicates that the patients did not have any cases of infection with the Coronavirus, either old or recent, and they did not receive the vaccine against the Coronavirus, Figures 9.

Through our study, we found that patients with type 2 diabetes who have blood type O+ are more susceptible to infection with the Coronavirus, followed by blood type A+,

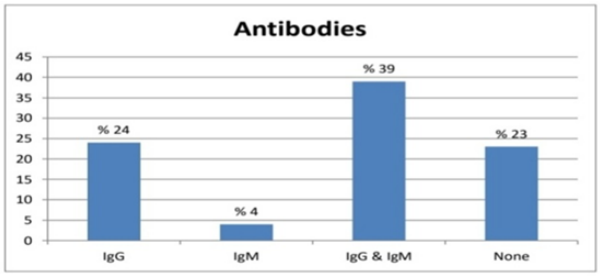

Figure 9: Percentage of presence of IgG and IgM antibodies in diabetic patients

as the second highest blood type for infection, and the blood type least susceptible to infection was O-. The results of our study were consistent with a study that found that blood type O represents the highest percentage of Saudi patients infected with COVID-19, followed by blood type A [20], [21].

4. Conclusion

We discovered that the age group most impacted by diabetes is those between the ages of 41 and 60 through the research we did. We discovered that there were more female than male diabetic patients. Because type 2 diabetes has a higher incidence than type 1 diabetes, the results also show that there were more patients with type 2 diabetes than type 1 diabetes. Our research revealed that individuals with blood type O+ who have diabetes are more vulnerable to type 2 diabetes and the coronavirus, whereas blood type A+ patients are less susceptible to these conditions.

Conflict of interest

The authors declare no conflict of interests. All authors read and approved final version of the paper.

Authors Contribution

All authors contributed equally in this paper.

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