Potential Relationship between ABO Blood Group and COVID-19 Susceptibility

Sara Kareem Shalal[1]

[1]*Thi-Qar Education Directorate , Thi-Qar, Iraq. Email: sara.kareem@utq.edu.iq*

KEYWORDS
The ABO blood group and Rh are the major considerations with Covid-19.

ABSTRACT
Numerous research have looked into the potential relationship between blood group systems and the severity of COVID-19, with varying degrees of success. However, depending on how common the Rh and ABO blood types are in a given community, their correlations with COVID-19 may also vary. Thus, in order to explore this relationship more thoroughly and give population-based data to the global scientific community, we carried out this study on Iraqi people. Methodology: Every patient who arrived at Al-Shatra General Hospital in the province of Thi-Qar between December 2022 and June 2023 had their data examined. One hundred participants, ranging in age from eighty to eighty, made up the study. Their hospital medical records were used to determine their ABO, Rh type, and COVID-19 positive. Result: The total number of patients was 100, and males constituted 56% of this population. Among the 100 patients, 19% were diagnosed with diabetes mellitus while 34% had hypertension. From the findings, it was noted that A+, B+, and O+ blood types had more occurrences of COVID-19 positive cases. Interestingly, the percentage of individuals testing positive for COVID-19 was higher at 58% among those with hypertension and lower at 42% among those with diabetes mellitus. Conclusions: The relationship between blood types and COVID-19 infection is a multifaceted dynamic that encompasses various factors, including comorbidities, age, sex, and the distribution of blood groups within a population. It has been observed that individuals with hypertension are more prone to experiencing elevated rates of COVID-19.

1. Introduction

The coronavirus illness that causes severe acute respiratory syndrome (SARS-CoV-2) has raised serious concerns for public health ever since it first surfaced in 2019 (1). 5,978,096 people had died from the sickness as of March 7, 2022, out of 440,807,756 verified cases worldwide (2). Numerous blood group systems are established, and numerous studies have connected blood group vulnerability to diseases (3). There have been reports of a link between several infectious diseases and the Rh and ABO blood groups (4). Recent international research has examined the connection between Rh and ABO blood types and SARS-CoV-2 infection (5). The development of the illness management guidelines may benefit from an understanding of blood group types and the relationship between COVID-19 severity and them (6). However, since the interactions between the Rh and ABO systems can vary amongst groups, so too can their correlations with COVID-19 (7). ABO phenotypic frequencies differ significantly throughout populations and geographical regions (8,9). We carried out the investigation to ascertain the relationship between ABO blood group and COVID-19 positive in the southern Iraqi population.

2. Material and Methodology

The medical records of 100 patients, ages 18 to 80, who visited Al-Shatra General Hospital in the Thi-Qar province between December 2022 and June 2023 were the subject of this observational retrospective analysisEach and every retrieved piece of data was derived from verified cases using real-time polymerase chain reaction (PCR). The COVID-19 facility in Baghdad conducted real-time PCR analysis. The Xpert Xpress SARS-CoV-2/Flu/RSV rapid multiplexed real-time RT-PCR assay was used to concurrently identify and differentiate SARS-CoV-2, influenza A, influenza B, and respiratory syncytial virus (RSV) in the patients' nasopharyngeal swabs. The Cepheid GeneXpert system performs the analysis in accordance with the manufacturer's instructions. Using an Arena BioScien hemagglutination assay, the patients' ABO and Rh testing analysis was carried out. For Rh testing, which determines if the appropriate antigen is present in blood samples or not, the anti-A, anti-B, anti-AB, and anti-D antigens were detected using the slide technique. The test was carried out in accordance with the manufacturer's guidelines. Information on patients who have comorbid conditions like hypertension or diabetes mellitus.Participants' ages ranged from eighty to eighty years old. Some other risk factors, such weight and smoking status, were not included in the patient records, so we were

unable to confirm them.

3. Results and Discussion

Table 1: Gender distribution

Gender	No. of patient	Percentage
Male	56	**56 %**
Female	44	**44 %**
Total	100	**100 %**

Table 2: Blood group distribution

Blood group	No. of patient	Percentage
A+	19	**19 %**
A-	4	**4 %**
B+	23	**23 %**
B -	3	**3 %**
AB +	18	**18 %**
AB -	3	**3 %**
O +	27	**27 %**
O -	3	**3 %**
Total	100	**100 %**

Table 3: Age group distribution

Age	No. of patient	Percentage
18 – 30	20	**20 %**
31 – 45	26	**26 %**
46 – 60	29	**29 %**
Above 60	25	**25 %**
Total	100	**100 %**

Table (4): Contact with COVID person

Contact with Covid- person	No. of patient	Percentage
No	76	**76 %**
Yes	24	**24 %**
Total	100	**100 %**

Table 5: Hypertension and Diabetic Mellitus in COVID symptomatic patients

Hypertension	No. of patient	Percentage
No	66	**66 %**
Yes	34	**34 %**
Total	100	**100 %**
Diabetic Mellitus	No. of patient	**Percentage**
No	81	**81 %**
Yes	19	**19 %**
Total	100	**100 %**

Table 6: COVID report of patients

COVID report	No. of patient	Percentage
Positive	56	**56 %**
Negative	44	**44 %**
Total	100	**100%**

Table 7: Relationship between gender and COVID reports.

COVID report	Male	Female
Positive	32 (57%)	**24 (54%)**
Negative	24 (42%)	**20 (45%)**
Total	56 (100%)	**44(100%)**

Table 8: Relationship between blood group and COVID reports

Blood group	Covid positive	Covid Negative	Total
A +	9	10	**19**
A -	2	2	**4**
B +	12	11	**23**
B -	2	1	**3**
AB +	10	8	**18**
AB -	2	1	**3**
O +	17	10	**27**
O-	2	1	**3**
Total	56	44	**100**

Table-9: Relationship between COVID-19 reports and diabetes mellitus and hypertension

Hypertension	Covid Negative	Covid positive	Total
No	36(54%)	30(45%)	**66(100%)**
Yes	14(41%)	20(58%)	**34 (100%)**
Diabetic Mellitus	Covid Negative	Covid positive	**Total**
No	51(62%)	30(37%)	**81(100%)**
Yes	11 (57%)	8(42%)	**19 (100%)**

The present investigation examined the correlation between Iraqi participants' ABO blood types and the level of COVID-19 infection. The prevalence of the Rh and ABO systems may vary among communities, as may its relationship with The COVID-19 virus. The patient demographic showed a higher proportion of males than females, with nearly 56% of the patient population being male and 44% being female. COVID-19 has been well investigated with regard to risk factors, infectivity, pathophysiology, and management. It is a serious health concern worldwide. With a 3:1 M:F ratio, there was a majority of male individuals among COVID-19-positive cases. One established risk factor for COVID-19 is being a man (9). Based on their blood types, the patients' distribution is shown in table (2). O+ accounts for 27 instances (27%), while B+ accounts for 23 cases (22%), making up the majority of the 100 patients who were taken into consideration. 19 cases (19%) belong to A+, while 18 cases (18%) belong to AB+. Of the total, 3 cases (or 4% of the cases) belong to each of the blood groups O, B, AB, and A. The patient population's blood group distribution is revealed by these data. After multiple research, blood group has also come back as one of these risk factors. On red blood cells, oligosaccharides called ABO antigens are found (10). This is in line with research conducted in Libya, which discovered that individuals with COVID-19 who belonged to blood group A were at a higher risk of being hospitalized for a serious infection, while those with blood group O were at a lower risk (5). Because blood type antigens are polymorphic and exhibit varying inheritance patterns in different groups, they have become a major subject of epidemiological investigations (11). The age group of 46–60 years old has the greatest number of cases (29 cases, 29%), followed by the age group of 31–45 years old (26 cases, 26%), according to the data shown in Table 3. With only 20 instances (20% of the total), the 18–30 age group accounts for a sizable majority of cases. With 25 instances (25%), the over-60 age group is in the middle. With regard to the distribution of instances among various age groups, this data offers insightful information. Table 4 shows that, of the 100 patients analyzed, 76 (or 76%) had never interacted with a person who has been diagnosed with COVID-19. 24 out of the remaining individuals (24%) have attested to having come into contact with a Covid-19

contaminated person. Within table (5): A little over one in two individuals in this sample had hypertension, while 34 (34%) and 66 (66%) did not have hypertension, respectively. Furthermore, 19 (19%) and 81 (81%) of the patients in this group, respectively, had diabetes mellitus and did not; this indicates that approximately 1 in 5 of the patients had the condition. A 19% of the participants had diabetes mellitus. Diabetes mellitus is present in 10–35% of people, according to several research (11). The immunological profile of people with diabetes mellitus changes from regulatory T-cells to proinflammatory Th1 and Th17 CD4+ T cells, making them more vulnerable to infection (12). Of the 100 patients included, 56 patients (56%) have tested positive for COVID. The data presented concentrates on the COVID report status of the patients in the table (6). On the other hand, 44 patients (44%) have negative COVID test results. The information displayed primarily focuses on how the COVID report results are distributed by gender in table (7). Twenty females and twenty males were found in the "Negative" COVID report category, while 32 males and twenty females were found in the "Positive" COVID report category. The distribution of unfavorable reports between males and females does not differ statistically significantly, as indicated by the computed p-value of 0.49. Table (8) provides the data that indicates the number of COVID report cases for every blood type. The highest numbers of negative reports (10, 11 and 10 cases, respectively) are seen in blood groups A+, B+, and O+. The computed p-value of 0.41 indicates that among the 100 people examined, there was no discernible variation in the distribution of COVID report distribution between blood groups. Rh positivity and COVID-19 positivity were found to be associated, suggesting that Rh-positive people are more likely to be infected with COVID-19. This is consistent with a study (12) that showed Rh negativity to be a protective factor against COVID-19 infection. ABO blood group and COVID-19 susceptibility and severity are related, although the underlying mechanisms are unclear and have been explained by a number of ideas.One factor that can increase or decrease the ability of viral spikes to attach to the target host cells is the presence of receptors on the surfaces of the host cells. The existence of naturally produced anti-A and anti-B antibodies represents an additional possible mechanism that may mitigate the severity and vulnerability of COVID-19. Opsonization is one method that can accomplish this; it involves attaching itself to host cells and killing the virus; another method involves preventing the viral spikes from interacting with target cell receptors (6).

4. Conclusion and future scope

34 hypertensive individuals were included in table (9), of whom 14 had negative COVID-19 test results and 20 had positive results. The statistical significance of the link between hypertension and the P value is $p < 0.05$. This indicates a high correlation between COVID-19 and hypertension, which is in line with the findings of Kudo et al. (8) in India. Eight of the 19 patients with diabetes mellitus had positive COVID-19 test results, This is statistically significant ($p<0.05$), with the COVID-19 test results being negative for 11 of the patients. The absence of data from other places was a major limitation. The sample size was small. The analysis of the association between COVID-19 and blood types did not take into consideration confounding factors like age, diabetes and hypertension. Thus it can be concluded that the relationship between blood types and COVID-19 infection is complicated and dependent on various variables such as comorbidities, age, sex, or the geographic distribution of the blood groups in the community; hypertension is associated with higher rates of COVID-19.

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