IgE Immunoglobulin Level and its Association with Morbidity in COVID-19 Positive Patients

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Abstract:

Background: COVID-19, caused by the novel coronavirus, has led to a global pandemic with varying severity among individuals. Blood group associations and IgE levels have been subjects of interest in understanding the disease's impact.

Methodology: We conducted a retrospective study, comparing 200 COVID-19 diagnosed patients with 100 controls. RT-PCR confirmed COVID-19 cases. Blood groups and IgE levels were determined using established methods. Statistical analysis was performed using chi-square tests.

Results: Among COVID-19 patients, 63.01% were men, significantly higher than controls (p<0.001). Blood group A was most prevalent (46.17%), while AB was the least (9.04%). IgE levels were significantly elevated in COVID-19 patients across all blood groups (p<0.001), except for AB Rh (-) (p=0.117).

Recommendations: Further research is needed to understand the blood type-COVID-19 connection. Utilize IgE levels for risk assessment, raise public awareness, enhance healthcare collaboration, and consider policy implications. Continued investigation into COVID-19 susceptibility factors is essential.

Conclusion: This study highlights the potential association between IgE levels and COVID-19 and underscores the need for further research on blood group implications. Understanding these factors can contribute to a better understanding of COVID-19 susceptibility and severity.

Keywords: COVID-19, Blood groups, IgE levels, Susceptibility

Introduction

Human coronaviruses were the cause of 15–30% of common cold infections prior to the emergence of SARS. A class of RNA viruses known as coronaviruses can infect both humans and a variety of animal species. Wuhan, China, had the beginning of a COVID-19 outbreak in December 2019 [1]. After it swiftly spread throughout the world, the World Health Organization (WHO) proclaimed it to be a pandemic [2]. Asymptomatic, moderate, and severe are the three clinical categories of COVID-19; the death rate in severe cases is 2-3%. The likelihood of severe COVID-19 is influenced by a number of variables, including age, sex, and underlying medical disorders [3, 4].

The presence or lack of A and B antigens determines the blood group, which is dependent on the AB0 gene on chromosome 9. Studies examining the relationship between blood types and various illnesses, such as the severity and susceptibility to COVID-19, have yielded inconsistent findings. Antigens are bound by molecules called immunoglobulins (Ig), including IgE. Often known as the "allergic antibody," IgE is involved in the treatment of allergic illnesses, protection against tumours, and the body's reaction to parasite infections. Age groups and clinical circumstances can have disparities in IgE levels [5, 6].

RT-PCR analysis is the gold standard for COVID-19 diagnosis. Common test results include lymphopenia; in more severe cases, thrombocytopenia, leukopenia, and high CRP levels may also be present. Although these anomalies are more noticeable in extreme cases, some liver and muscle enzyme levels can also be impacted.

Methodology

Study Design: This study was retrospective in nature.

Study Setting: This study was conducted by collecting nose and throat swabs reviewing medical records of a patient who were admitted to the emergency department with clinical complaints or

COVID-19 contacts between in 2020-2021 and they were confirmed as COVID-19 positive by RT-PCR.

Participants: Participants in the hospital who had their blood groups and IgE levels known were reviewed. They served as the control group. We compared the IgE levels in COVID-19 positive patients based on their blood groups and Rh factor with this control group. Viral ribonucleic acid reverse transcriptase-polymerase chain reaction (RT-PCR) was used to confirm the patients' COVID-19 positive status.

Study Size: Retrospective comparisons of the blood types and IgE levels of the control group (100 patients) were made with 200 patients who were admitted to our hospital.

Data Collection and Analysis: Gel card method was used to ascertain the patients' blood type and Rh factor. A level of 165 IU/ml or higher was deemed high for IgE, which was measured using the nephelometry method with the Beckman Coulter

IMMAGE 800.IBM SPSS version 20.0 was used for data analysis.

Bias: To minimize bias, the goal of the research was not disclosed to the participants or healthcare providers during data collection. Additionally, data analysts were blinded to the identity of the participants.

Statistical Analysis: Chi-square analysis was used to utilized to assess the Rh positivity and IgE increase among COVID-19 positive and different blood types undesirable groupings. Using frequency distributions and percentages, the study's findings were examined.

Ethical Considerations: The study was carried out in accordance with ethical guidelines, which included getting each participant's informed consent. The ethics committee examined and approved the study protocol.

Results

Table 1: Comparison of IgE Elevations with Blood Groups According to Rh(+) and Rh(-) Factors

Blood Group	Rh Factor	Patient IgE (%)	Control IgE (%)	Total Patients	p-Value
A	Rh+	67 (33.5%)	25 (12.5%)	92 (46%)	0.002
A	Rh-	10 (5%)	32 (16%)	42 (21%)	<0.001
B	Rh+	32 (16%)	20 (10%)	52 (26%)	<0.001
AB	Rh+	9 (4.5%)	13 (6.5%)	22 (11%)	0.001
B	Rh-	5 (2.5%)	21 (10.5%)	26 (13%)	<0.001
AB	Rh-	3 (1.5%)	7 (3.5%)	10 (5%)	0.171

In this study, we obtained ethical permission from Non-interventional Research Ethics Committee, following the Declaration of Indian ethical guidelines. We collected nose and throat swabs from 200 patients admitted to the emergency department, confirmed as COVID-19 positive using RT-PCR. We determined their blood groups and Rh factors using the Grifols Eflexis Diana gel card system from India. IgE levels were measured with Beckman Coulter's IMMAGE 800, considering levels of 165 IU/ml or higher as high. We established a control group of 100 patients with known blood groups and IgE levels admitted to our hospital. We compared COVID-19 positive patients' IgE levels based on blood groups and Rh factors with the control group. Data analysis was conducted using IBM SPSS version 20.0, employing the chi-square test to compare IgE elevation in terms of blood types and Rh positivity among COVID-19 positive and negative groups. The results were assessed through frequency distributions and percentages, with chi-square results presented in table format along with p-values.

In the results, we retrospectively compared the blood types and IgE levels of 200 COVID-19 diagnosed patients with a control group of 100 patients. Among the COVID-19 positive patients,

63.01% were men, and 36.98% were women. In the control group, 50.55% were men, and 49.44% were women. COVID-19 positivity was significantly higher in male patients than in the control group. The A blood group had the highest frequency (46.17%), while the AB blood group had the lowest (9.04%). An increase in IgE levels was statistically significant in COVID-19 positive patients compared to the control group, both for Rh(+) and Rh(-) blood factors, except for AB Rh (-), which did not show a significant increase.

Discussion

According to our analysis, blood group A was found to be the most common (46.57%) among COVID-19 patients, whereas blood group AB was the least represented (9.04%). Numerous investigations have looked into the possible connection between blood types and COVID-19 vulnerability.

According to various theories, blood group, people may be more vulnerable to the virus because specific antigens are present on their cells. According to certain research, people with blood type O seem to have a decreased risk of contracting COVID-19 infection than people with blood type A [7]. Apart from blood types, we also examined IgE levels in patients with COVID-19. Although increased IgE

levels are commonly linked to allergy illnesses, they can also arise from a number of other ailments, such as viral infections. When compared to the control group, our results revealed a statistically significant increase in IgE levels across all blood groups in COVID-19 patients. This implies that elevated IgE levels could be a prevalent characteristic in COVID-19 cases. All things considered, our research adds to the expanding corpus of information about putative risk factors and biomarkers linked to COVID-19 susceptibility. But more investigation is required to validate and build on these results because the connection between blood types, IgE levels, and COVID-19 is still not entirely understood [8, 9].

In addition to exploring the correlation between blood types and COVID-19 susceptibility, our study also delved into the IgE immunoglobulin levels among COVID-19 patients. Elevated IgE levels, commonly associated with allergic diseases, have shown a significant increase across all blood groups in COVID-19 patients compared to the control group. This finding suggests that high IgE levels might be a prevalent characteristic in COVID-19 cases, potentially influencing the disease's severity and the patient's hospitalization duration [10].

Elevated IgE levels in COVID-19 patients have been linked to increased disease severity. Elevated IgE may correlate with clinical outcomes like respiratory distress, need for intensive care unit (ICU) admission, and even mortality rates [11]. The role of IgE in immune response during viral infections such as SARS-CoV-2 appears to be complex. Unlike its well-known function in allergic reactions, IgE's involvement in COVID-19 may relate to a heightened immune response, potentially exacerbating inflammatory processes [12]. Studies have suggested that patients with higher IgE levels upon hospital admission may require more vigilant monitoring and aggressive treatment strategies to manage severe symptoms [13].

Our analysis indicates a potential correlation between elevated IgE levels and prolonged hospital stays for COVID-19 patients. This could be due to more severe symptoms or complications requiring extended medical care. IgE levels might serve as a predictive biomarker for hospitalization duration, aiding clinicians in estimating the required length of treatment and resource allocation for COVID-19 patients [14].

The role of IgE in viral infections is an emerging area of interest. In the context of COVID-19, elevated IgE levels could reflect a unique aspect of the immune response, distinct from its traditional association with allergies [15]. Understanding the specific mechanisms through which IgE influences COVID-19 progression and outcomes is crucial for developing targeted therapeutic strategies.

Conclusion

The purpose of this study is to determine whether Rh factors and IgE increase in COVID-19 patients, as validated by PCR, are associated with the AB0 blood group. In COVID-19 patients, our study showed a considerable increase in total IgE level, with the exception of AB Rh (-) individuals. Utilizing serological methods, all characteristics of COVID-19-positive individuals in the global general population should be assessed.

Limitations: The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation: Further research is needed to understand the blood type-COVID-19 connection. Utilize IgE levels for risk assessment, raise public awareness, enhance healthcare collaboration, and consider policy implications. Continued investigation into COVID-19 susceptibility factors is essential.

List of Abbreviations:

1. COVID-19 - Coronavirus Disease 2019
2. RT-PCR - Reverse Transcriptase-Polymerase Chain Reaction
3. IgE - Immunoglobulin E
4. Rh - Rhesus factor
5. WHO - World Health Organisation
6. CRP - C-reactive protein
7. RNA - Ribonucleic acid
8. IU/ml - International Units per milliliter
9. IBM SPSS - International Business Machines Corporation Statistical Package for the Social Sciences

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