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Relación entre los grupos sanguíneos, susceptibilidad y severidad de la Covid-19

Relationship between blood groups, susceptibility and severity of Covid-19

Jaime Paulino Uamusse [1]

1 Medicina. Universidad de Ciencias Médicas de La Habana. Facultad "Salvador Allende". La Habana. Cuba.

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ABSTRACT

Introduction: in recent years, there has been an interest in knowing whether ABO blood system antigens have a role in the susceptibility of SARS-CoV-2 infection or in the severity of the disease. Because the antigens of the ABO system have been associated with other types of diseases.

Objective: understand the relationship between blood groups and the susceptibility and severity of COVID-19.

Materials and methods: a literature review study was carried out that had a total of 21 bibliographies consulted, which were cited throughout the work.

Development: it has been shown that microorganisms can stimulate the production of antibodies against blood group antigens such as those of the ABO system and in parallel, the natural antibodies of the ABO system can be considered part of the immune system against some bacterial pathogens and enveloped viruses that carry these antigens in a constitutive way.

Conclusions: different blood groups play an important role in the development of infectious diseases. And that people with blood group A are more susceptible to developing the most severe form of the disease than other blood groups, while people with blood group O are at lower risk of developing the most severe form of the disease.

RESUMEN

Introducción: en los últimos tiempos ha crecido un interés en conocer si los antígenos del sistema sanguíneo ABO tienen un papel en la susceptibilidad de infección por SARS-CoV-2 o en la gravedad de la enfermedad. Debido a que los antígenos del sistema ABO se han asociado a otro tipo de enfermedades.

Objetivo: explicar la relación entre los grupos sanguíneos y la susceptibilidad y gravedad de la COVID 19.

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Materiales y métodos: se realizó un estudio de tipo revisión bibliográfica que contó con un total de 21 bibliografías consultadas, las cuales fueron citadas a lo largo del trabajo.

Desarrollo: se ha demostrado que los microorganismos pueden estimular la producción de anticuerpos contra antígenos de grupo sanguíneo como los del sistema ABO y paralelamente, los anticuerpos naturales del sistema ABO pueden considerarse parte del sistema inmunitario contra algunos patógenos bacterianos y virus envueltos que portan estos antígenos de forma constitutiva.

Conclusiones: los diferentes grupos sanguíneos tienen un papel importante en el desarrollo de las enfermedades infecciosas. Las personas con grupo sanguíneo A son más susceptibles a desarrollar la forma más severa de la enfermedad que los demás grupos sanguíneos, mientras que, las personas con el grupo sanguíneos O son tienen menor riesgo de desarrollar la forma más severa de la enfermedad.

INTRODUCTION

When an outbreak of severe acute respiratory infection known as Wuhan pneumonia was identified in Wuhan, China, at the end of 2019, little was suspected that it would reach the current pandemic magnitude. The causal agent of the present epidemiological emergency is the new coronavirus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) and the resulting disease COVID-19 (coronavirus disease 2019).[1]

Since 2019, COVID-19 has claimed the lives of more than 549 thousand people around the world. Mexico has been ranked as one of the countries with the highest number of deaths, surpassing countries such as Italy and Spain. The clinical picture of this disease ranges from asymptomatic cases, mild, moderate symptoms (pneumonia) to severe cases, which manifest with acute respiratory distress syndrome (ARDS), which entails high mortality. The pathogenesis of severe COVID-19 is poorly understood, but factors such as age, sex, and the presence of comorbidities have been associated with its mortality.[2]

In 2022, the COVID 19 epidemic in Cuba registered an incidence rate of 19.93 per 100 thousand people. The provinces with the highest incidence rate were Havana (56.15), Matanzas (28.64), Villa Clara (28.11) and Ciego de Ávila (22.05). To reduce the impact of COVID-19 in Cuba, the measures adopted by the Government were decisive, fundamentally those that were based on the most vulnerable groups. Thanks to the potential of the Cuban health system, mortality has not been so severe, so it would also be relevant or important for the Cuban

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scientific community to understand what relationship exists between the antigens of the ABO system and COVID-19.3 In recent times, interest has grown in knowing whether ABO blood system antigens play a role in susceptibility to SARS-CoV-2 infection or in the severity of the disease. Because ABO system antigens have been associated with other types of diseases,[3] such as oncological diseases (ovarian, gastric, and prostate cancer), [4] and infectious diseases, including those caused by parasites such as Plasmodium falciparum and Plasmodium vivax, bacterial infections such as those caused by Escherichia coli, Helicobacter pylori and also viral infections by parvovirus B198, hepatitis B virus, chikungunya virus and West Nile virus, among others.[5]

It has been the focus of international research groups to characterize affected patients from a clinical, epidemiological and genetic point of view to generate more efficient action protocols in healthcare management.[6] Since the discovery of the ABO system by Karl Landstainer, blood groups have been associated with the disease.[7]

Identifying the relationships between blood groups and the susceptibility and severity of COVID 19 is the main objective of this bibliographic review. This work will provide the author with a deeper insight into the relationships between blood group and infectious diseases, especially COVID-19, which will be of great significance for all medical personnel when facing and taking appropriate behaviors during times of pandemic and in this way personalized medicine will be developed.

METHOD

To achieve the main objective of this study, a bibliographic review of the contents related to the proposed topic was carried out. Google Scholar was the browser used to search the information with Infomed, Scielo and others as the databases consulted, where 21 bibliographic references were selected for the study taking into account the objective of the topic and their quality. All references used were cited during the work, thus respecting these bases used. To carry out the introduction and development, the deduction-induction method was used while the deductive-inductive method was used for the conclusions. Ethical aspects were complied with throughout the work when dealing with issues related to human health.

DEVELOPMENT

The difference in the expression of ABO blood group antigens can vary susceptibility to many infections. Some blood groups are linked to receptors for different microorganisms, including viruses, and some blood groups can modify innate immunity in response to infection.

2 Epidemiology

As of April 14, 2020, more than 1,792,000 positive cases have been confirmed worldwide, more than 110,000

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people have died, and more than 412,000 patients have recovered from the disease, according to data from Johns Hopkins University. [5] On April 11, 2020, the United States became the country most affected by the coronavirus, with 530,200 confirmed cases and 20,614 deaths recorded.6 In total, there are five countries with more than 100,000 positive cases. USA, followed by Spain (1616027 cases), Italy (152,271 cases), France (130,730 cases) and Germany (125,452 cases). China has a total of 83,134 cases.[6]

In terms of deaths, behind the US are Italy (19,468 deaths), Spain (16,972 deaths), France (13,832 deaths), the United Kingdom (9,875 deaths) and China with 3,343 deaths.[7]

In the region of the Americas, 153 million 964 thousand 278 confirmed cases are reported (+ 34 thousand 444), 30.5% of the total cases reported in the world, with 3 million 115 1,948 active cases and 2,744,915 deaths (+ 137) for a fatality rate of 1.78% (-0.01).[8] Taking into account the data presented above that belong to different bibliographies consulted, the author believes that the COVID-19 pandemic has been a challenge for the entire world, since every day cases and cases of this disease are recorded, including high numbers of deaths from it. This draws the attention of the entire scientific community in the search for more information to understand enough to devise strategies to mitigate the damage that this disease has caused today. The nature of the virus and the disease The new coronavirus repeats almost 80% of the genetic sequence of its predecessor SARS-CoV, and like other coronaviruses it mutates in pathogenesis.[7]

Coronaviruses express transmembrane glycoproteins that allow the virus to adhere and between the target cell. These glucoroteins are very similar to those of SARS-CoV and bind to the surface angiotensin-converting enzyme II (ACE2) receptors.[9]

Viral replication of RNA linked to the nucleoprotein occurs within the target cell, using RNA polymerase dependent on RNA (rdRp).10 (See Annex 1)

The main route of transmission is respiratory, through microdroplets, it has been detected in feces, but in small quantities, hence the protection measures contemplate the use of masks, frequent hand hygiene with soap and water, to which have been added other preventive measures adopted in many countries, such as quarantine and social distancing. 6,10 Clinical The incubation period, based on case studies from Europe, could be 2 to 14 days.[11]

The majority (80%) of cases are asymptomatic (may be contagious) or have mild symptoms with general malaise and cough mild, while 15 percent have a moderate condition with fever, persistent dry cough, fatigue, without pneumonia, and 5% have severe symptoms, characterized by constant fever, cough, severe dyspnea, especially due to viral pneumonia; cardiovascular damage, multi-organ failure, and between 3 to 4% of those affected may die.[11]

The author of this work suggests that these clinical characteristics of covid-19 have provided a lot of

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information to the entire community, and that they should serve as a greater importance in the fight against covid-19. Therefore, it is essential that the community helps in compliance with prevention measures and always go to the doctor in the event of a respiratory symptom or contact with infected people, since it has been shown that in some it is symptomatic, but in some it is asymptomatic. Blood group system and its relationship with infectious diseases Blood groups are genetically determined traits with known polymorphic expression, in blood cells and other cell groups, among individuals and populations.[6]

Currently, there are 39 blood group systems and hundreds of individual blood group alleles and antigens; recognized by the International Society of Blood Transfusion (ISBT). [12]

It has been shown that microorganisms can stimulate the production of antibodies against blood group antigens such as those of the ABO system and in parallel, natural antibodies of the ABO system can be considered part of the immune system against some.

ABO blood group system

The blood group system of the ABO system is made up of two antigens A and B and group O does not present anglutinogens. Their combinations form blood groups A, B, AB, and O. The addition of an immunodominant sugar to the precursor substance H in the fucose position stops the elongation of the chain, its branching, and thus determines the blood group, according to the transferase that intervenes in the modification.[14]

A person from group O has both anti-A and anti-B, group A, anti B and group B, anti A; while group AB, which expresses both antigens, is negative for ABO Antibodies.[15]

A more recent study suggests that ABO is an ancient balanced polymorphism that originated early in hominid history and has been maintained in multiple lineages of primates. [16]

The author of this work believes that the distribution of the most frequent ABO blood groups in populations from different geographical regions is an expression of their adaptation and the evolutionary pressures of individuals. Relationship between the ABO system and the pathogenesis of Covid 19 In the first reports by Zhao et al., they suggest that comorbidities and blood group A and AB were the most distinctive characteristics of the seriously ill patients and those who died from Covid-19 in three hospitals. from Wuhan and Shenzhen, China.[17]

The results showed that blood group A was at higher risk of acquiring COVID-19 compared to non-A groups, while blood group O was associated with a lower risk compared to non-O groups. .18 Similar results of association between the ABO system blood group and COVID-19 were found in patients from Spain and Italy which, for a period of more than two months, were the global epicenter of the pandemic in 2020. During this period, performed a comprehensive GWAS (genome-wide association study) for COVID-19 respiratory failure. The researchers associated several genes with relevant functions for severe Covid-19 due to their functions

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related to the inflammatory response, the entry of the virus into the cell and the blood group of the ABO system respectively.[18]

A new study published in the journal «Blood Advances », suggests that SARS-CoV-2 is particularly attracted to the blood group A antigen found on respiratory cells. One of the proteins on the surface of the SARS-CoV-2 virus, the receptor binding domain protein or RBD, has been evaluated. This protein is the part of the virus that adheres to the host's cells and has been shown to have greater affinity with the respiratory cells of the individual with blood groups A and AB.[1,18]

These approaches have allowed the author of the present study to report that blood group A patients are most associated with the susceptibility and severity of COVID-19. The reasons why individuals with blood group A and AB are more susceptible to developing the severe form of COVID-19 is due to a greater affinity between the receptors on the respiratory cells of individuals with these blood groups and the protein RBD that is part of the surface structure of the virus that causes COVID-19. A multicenter cohort study that included adults confirmed with COVID-19 who were critically ill and admitted to the intensive care units of 67 hospitals in the United States of America, that blood group O has a protective effect especially in people of African descent.19

One study demonstrates that a strong downregulation of ACE2 (Angiotensin-converting enzyme 2) - competitive inhibition of ACE2 by SARS-CoV-2 and anti-A and B antibodies - associates elevated plasma levels of Ang-II, allowing a possible lower capacity SARS-CoV-2 infection in patient

On the other hand, there are problems with distribution and education of the population, which must improve to follow prevention measures and the proper use of masks. For this, a real alternative to possible problems with the distribution of medical masks is the replacement by citizens with homemade masks. A study reports that cotton masks do not present significant differences compared to medical masks in terms of the levels of respiratory droplets released by sick people in small environments (for example, the bedroom or car). Knowledge of this relationship between the ABO System antigens of blood groups and COVID-19 will allow for timely and effective treatment of the disease. However, knowledge of this relationship does not prevent contagion, which is why a series of tests are required. of health promotion and prevention measures mentioned below: It is essential to always use masks regardless of the origin or quality of the masks. But hygiene still appeals with homemade masks, since they are made of cotton and are reusable. That is why it is essential to always be washed and ironed after use and before use. The author of this work considers that correct hand washing is essential to prevent the disease. But for this it stands out that the procedures for correct hand washing and the situation in which one finds oneself must be taken into account, since the greater the exposure to the virus, the greater the risk of becoming infected. Therefore, hand washing must be intensified over time and at the times of hand washing depending on the degree of exposure one finds. For

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the author of this study, it also highlights that community isolation should be taken with special consideration, mainly by vulnerable groups such as older adults and people who have a serious underlying illness; Newborns, given that they have an immature immune system and that their symptoms are difficult to detect, it is also advisable to have greater prevention measures with them.

CONCLUSIONS

It has been shown that different blood groups, especially the ABO system, play an important role in the development of infectious diseases. People with blood group A and AB are more susceptible to developing the most severe form of COVID-19 than other blood groups, while people with blood group O have a lower risk of developing the most severe form of the disease. . It is recommended that individuals with blood group A and AB intensify compliance with prevention measures for this disease since in some way they are considered risk groups for the disease while blood group O has a protective effect.

DECLARATION OF CONFLICT OF INTEREST

The author declares that he has no conflict of interest in the preparation of the research.

FINANCING DECLARATION

The author declares that he has not received funding to carry out this research.

STATEMENT OF AUTHORSHIP

Conceptualization: Jaime Paulino Uamusse Data curation: Jaime Paulino Uamusse

Formal analysis: Jaime Paulino Uamusse

Research: Jaime Paulino Uamusse

Methodology: Jaime Paulino Uamusse

Supervision: Jaime Paulino Uamusse

Validation: Jaime Paulino Uamusse

Visualization: Jaime Paulino Uamusse

Writing - draft original: Jaime Paulino Uamusse

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BIBLIOGRHAPHICS REFERENCIES

1. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. [Internet]. 2020 [citado 2023 Nov 23] ; 395(10223): [aprox. 6 p.]. Disponible en: https://www.thelancet.com/action/showPdf?pii=S0140-6736%2820%2930211-7
2. Torres Alarcón CG, García Ruíz A, Cañete Ibáñez CR, Morales Pogoda I, Muñoz Arce CM, Cid Domínguez BE. et al . Antígenos del sistema sanguíneo ABO como factor de riesgo para la gravedad de la infección por SARS-CoV-2. Gac. Méd. Méx [internet]. 2021 [citado 2023 Nov 23] ; 157(2): [aprox. 7 p.]. Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0016-38132021000200181&lng=es
3. Benítez Jiménez I, Oliveros Domínguez ER, Bourzac Macia L. Una mirada sociodemográfica a la incidencia de la COVID-19 en Cuba. Rev Cub Sal Públ [Internet]. 2022 [citado 2024 Ene 07] ; 48(2):[aprox. 3 p.]. Disponible en: https://revsaludpublica.sld.cu/index.php/spu/article/view/2667
4. Maguiña Vargas C, Gastelo Acosta R, Tequen Bernilla A. El nuevo Coronavirus y la pandemia del Covid-19. Rev Med Hered [Internet]. 2020 [citado 2023 Nov 23] ; 31(2): [aprox. 3 p.]. Disponible en: http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1018-130X2020000200125&lng=es
5. ÚltimaHora.sv. [Internet].San Salvador;Última Hora SV ® 2016[actualizada 2020 abr 12; citado 2023 Nov 23]. EE.UU. supera a Italia como el país con más fallecidos por COVID-19.[aprox. 1 p.] .Disponible en: http://ultimahora.sv/ee-uu-supera-a-italia-como-el-pais-con-mas-fallecidos-por-covid-19/
6. Bonilla Sepulveda Oscar Alejandro. Para entender la COVID-19. Medicentro Electrónica [Internet]. 2020 Sep [citado 2024 Ene 09]; 24(3): 595-629. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1029-

UNIMED ISSN: 2788-5577 RNPS: 2484
JANUARY-APRIL 2024; 6(1)

30432020000300595&lng=es

7. Expósito Lara Alexander, Feria Díaz Gisela Eduarda, González Benítez Sonia Noemí, Miguel Soca Pedro Enrique. Variantes genéticas del SARS-CoV-2 y sus implicaciones clínicas. MEDISAN [Internet]. 2021 Dic [citado 2024 Ene 09] ; 25(6): 1424-1446. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1029-30192021000601424&lng=es
8. Leaf RK, Al Samkari H, Brenner SK, Gupta S, Leaf DE. ABO phenotype and death in critically ill patients with COVID-19. Br J Haematol.[Internet]. 2020 [citado 2023 Nov 23] ; 190(4):[aprox. 8 p.] Disponible en: https://pubmed.ncbi.nlm.nih.gov/32609874/
9. Platero Portillo T, Lloclla Delgado S, Guevara Rodriguez N. Terapia de plasma convaleciente para pacientes con Covid-19: Revisión de la literatura. Rev. Fac. Med. Hum. [Internet]. 2020 [citado 2023 Nov 23] ; 20(4):[aprox. 5 p.] .Disponible en: http://www.scielo.org.pe/scielo.php?pid=S2308-05312020000400700&script=sci_arttext&tlng=en
10. Pendu JL, Breiman A, Rocher J, Dion M, Ruvoën-Clouet N. ABO Blood Types and COVID-19: Spurious, Anecdotal, or Truly Important Relationships? A Reasoned Review of Available Data. Viruses. [Internet]. 2021[citado 2024 ene 2] 22;13(2):[aprox. 20 p.].Disponible en: https://www.mdpi.com/1999-4915/13/2/160
11. LI Y, Xiufang W, Chen J, Cai Y, Deng A, Yang M. More on 'Association between ABO blood groups and risk of SARS-CoV-2 pneumonia'. Br J Haematol. [Internet]. 2020 [citado 2024 ene 2]; 190(1):[aprox. 1 p.].Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7267665/
12. Pare G, Chasman DI, Kellogg M, Zee RYL, Rifai N, et al. Novel Association of ABO Histo-Blood Group Antigen with Soluble ICAM-1: Results of a Genome-Wide Association Study of 6,578 Women. PLoS Genet. [Internet]. 2008 [citado 2024 ene 2] ;4(7):[aprox. 1 p.].Disponible en: https://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1000118
13. Rivero Jiménez RA. Enfermedades

UNIMED ISSN: 2788-5577 RNPS: 2484
JANUARY-APRIL 2024; 6(1)

infecciosas emergentes: transmisión por la transfusión de sangre. Rev Cubana Hematol Inmunol Hemoter [Internet]. 2006 [citado 2024 ene 2] ; 22(1):[aprox. 5 p.]. Disponible en: http://scielo.sld.cu/scielo.php?pid=S0864-02892006000100004&script=sci_arttext

14. Ruiz Bravo A, Jiménez Valera M. SARS-CoV-2 y pandemia de síndrome respiratorio agudo (COVID-19). Ars Pharm [Internet].2020 [citado 2024 ene 2] ; 61(2):[aprox. 12 p.].Disponible en: https://scielo.isciii.es/scielo.php?pid=S2340-98942020000200001&script=sci_arttext&tlng=en
15. Sáez García MA, García Anaya MP, Sánchez González B, Fernández Pascual C, Gracia Martínez M, Marqueta García O et al . La mortalidad del primer cuatrimestre de 2020 en la pandemia por COVID-19. Análisis del Comité de Mortalidad del Hospital Central de la Defensa «Gómez Ulla». Sanid. Mil. [Internet]. 2020 [citado 2024 ene 2] ; 76(2):[aprox. 12 p.].Disponible en: https://scielo.isciii.es/scielo.php?pid=S1887-85712020000200003&script=sci_arttext
16. Pacheco Romero J. La incógnita del coronavirus - Parte III. Rev. peru. ginecol. obstet. [Internet].2020 [citado 2023 dic 21] ; 66(4): [aprox. 6 p.]. Disponible en: http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S2304-51322020000400009
17. García García LR, Clos La-Torre M, Roncalés García A, Conget Dehesa AM, Vela Sanchez A. Primera transfusión extrahospitalaria en Aragón a paciente COVID-19. Hosp. domic. [Internet]. 2021 [citado 2023 dic 21] ; 5(4): [aprox. 6 p.]. Disponible en: https://scielo.isciii.es/scielo.php?pid=S2530-51152021000400217&script=sci_arttext
18. Trujillo L, Valenzuela S, von-Oetinger A. Relación entre grupos sanguíneos y SARS-CoV-2. Revista Cubana de Medicina General Integral [Internet]. 2021 [citado 2023 dic 21]; 37(supl): [aprox. 9 p.].Disponible en: https://revmgi.sld.cu/index.php/mgi/article/view/1668/489
19. Adams Villalón Y. Grupos sanguíneos en la susceptibilidad y gravedad de la

UNIMED ISSN: 2788-5577 RNPS: 2484
JANUARY-APRIL 2024; 6(1)

COVID-19. Revista Cubana de Hematología, Inmunología y Hemoterapia [Internet]. 2021 [citado 2023 dic 21]; 37:[aprox. 18 p.]. Disponible en: https://revhematologia.sld.cu/index.php/hih/article/view/1469

20. Sedano Chiroque FL, Rojas Miliano C, Vela Ruiz JM. COVID-19 desde la perspectiva de la prevención primaria. Rev. Fac. Med. Hum. [Internet]. 2020 [citado 2023 dic 21] ; 20(3):[aprox. 8 p.].Disponible en: http://www.scielo.org.pe/pdf/rfmh/v20n3/2308-0531-rfmh-20-03-494.pdf
21. Garcés Martínez M, Millán Marcelo JC. Enfrentamiento a la COVID-19: algunas precauciones esenciales para mitigar sus riesgos. Rev haban cienc méd [Internet]. 2020 [citado 2023 dic 21] ; 19(Suppl 1): [aprox. 6 p.]. Disponible en: http://scielo.sld.cu/scielo.php?pid=S1729-519X2020000400017&script=sci_arttext