

Estimation of Sociodemographic Factors and Blood Group Type with Risk of COVID-19 in an Indian Population.

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Abstract

The new public health crises were threatening the world with the emergence and spread of patients suffering from novel coronavirus (SARS-CoV-2). The epicentre of this highly contagious disease was Wuhan city, China, in December 2019. The World Health Organization (WHO) has verified the outbreak of novel coronavirus (2019-nCoV) as a global public health emergency of International Concern (PHEIC) (2). Currently, the major concern and clinical research on novel Coronavirus is inadequate or still in the primary stage Urgent need to develop safe and effective countermeasures that can be available, accessible and suitable for use in populations most in need. The outbreak is associated with exposures that surfaced in a Chinese seafood wholesale market. The novel virus, previously called the 2019-novel coronavirus (2019-nCoV), is currently designated as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), WHO officially named the disease COVID-19 in February 2020 and is registered by International Committee on Taxonomy of Viruses (ICTV). The observed variability in susceptibility to SARS-CoV-2 and severity of the ensuing COVID-19 have raised intense interest in their environmental and genetic risk factors. An early report from China suggested that blood group A was associated with increased susceptibility and blood group O was associated with reduced susceptibility to SARS-CoV-2 infection

Keywords: ABO Blood Group, Coronavirus, India, Seroprevalence, Herd immunity

Introduction

The new public health crises were threatening the world with the emergence and spread of patients suffering from novel coronavirus (SARS-CoV-2). The epicentre of this highly contagious disease was Wuhan city, China, in December 2019. The World Health Organization (WHO) has verified the outbreak of novel coronavirus (2019-nCoV) as a global public health emergency of International Concern (PHEIC) (2). Currently, the major concern and clinical research on novel Coronavirus is inadequate or still in the primary stage Urgent need to develop safe and effective countermeasures that can be available, accessible and suitable for use in populations most in need. The outbreak is associated with exposures that surfaced in a Chinese seafood wholesale market. The novel virus, previously called the 2019-novel coronavirus (2019-

nCoV), is currently designated as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), WHO officially named the disease COVID-19 in February 2020 and is registered by International Committee on Taxonomy of Viruses (ICTV). The observed variability in susceptibility to SARS-CoV-2 and severity of the ensuing COVID-19 have raised intense interest in their environmental and genetic risk factors. An early report from China suggested that blood group A was associated with increased susceptibility and blood group O was associated with reduced susceptibility to SARS-CoV-2 infection. These reports motivated widespread interest in examining ABO blood groups in Indian population as potential COVID-19 risk factors. Subsequent studies from Italy and Spain reported that blood group A was associated with an increased risk of severe COVID-19 and blood group O was associated with a reduced risk. In contrast, a large Danish study implicated disease susceptibility but not severity. However, observations from Indian Population confirm specific associations between ABO blood group and disease. The controversy raised by these contrasting reports led to this case control study.

Methods

Our objective in this case-control study was to independently test whether blood type is associated with SARS-CoV-2 susceptibility and COVID-19 severity. The study was approved by the Institutional ethical committee with a waiver of consent because the study represented no more than minimal privacy risk to individuals. This study is reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline. Sample was taken from Indian population Healthcare, a non-profit, integrated health care system of 15 hospitals and 6 district clinics in Varanasi, Jaunpur, Ballia, Sonbhadra, Bhadohi, Gazipur generated a SARS-CoV-2 and COVID-19-specific electronic health records with ICMR database. We searched this database for individuals who were tested for SARS-CoV-2 between January 1 and April 30, 2021, and had a recorded blood type. For individuals who underwent multiple tests, the first test with a positive result was chosen, otherwise the first test with a negative result was used. We compared positive vs negative test results, hospitalized vs non hospitalized patients, and intensive care unit (ICU) vs non-ICU patients. Infectivity was determined by SARS-CoV-2-specific polymerase chain reaction testing of nasal swabs or saliva samples. Analysis of variance assessed associations across ABO groups. Odds ratios (ORs) between ABO groups were assessed by logistic regression adjusted for age, sex, and Rh factor. P values were 2-sided, and statistical significance was set at $P < .167$ for each of the 2 primary comparisons.

Results

A total of 76796 individuals (mean [SD] age, 32.0 [17.8] years; 65 875 [76.9%] women) who had been tested for SARS-CoV-2 infection were included in the study. Further demographic

characteristics of the studied population and ABO blood group associations are shown in **Table 1**.

Table 1. Individuals' Characteristics by SARS-CoV-2 Positivity, Hospitalization, and ICU Admission

Characteristic	Individuals, No.		Value
Tested for SARS-CoV-2			
	Negative Results	Positive Results	
	90	30	
Age, mean (SD), y	41 (15.2)	45 (16.8)	0.2
Sex			
Men	439 (77.3)	16 (73.6)	0.01
Women	189 (22.7)	6 (26.4)	0.01
Blood type ^b			
O	372 (40.4)	15 (39.6)	0.01
A	12 (9.3)	7 (9.0)	
B	5 (3.3)	3 (3.2)	
AB	199 (47.1)	11 (48.1)	
Hospitalized, by ICU status			
	Non-ICU	ICU	
Men	15 (55.2)	10 (38.2)	0.01
Women	15 (44.8)	15 (61.8)	0.01
Blood type ^b			
O	10 (39.5)	7 (36.4)	0.01
A	1 (8.9)	1 (8.6)	
B	1 (3.6)	1 (2.8)	
AB	1 (48.0)	1 (52.1)	

Outcome	Type A vs Type O, OR (% CI)	Type B vs Type O, OR (% CI)	Type AB vs Type O, OR (% CI)	Value
Individual				

Positive test results	7 (0.93-1.01)	6 (0.89-1.03)	5 (0.86-1.07)	
Hospitalization	9 (0.80-0.99)	1 (0.75-1.09)	2 (0.77-1.35)	
ICU Admission	4 (0.69-1.02)	9 (0.64-1.23)	9 (0.40-1.18)	
Individually				
Positive test results	7 (0.93-1.01)	4 (0.87-1.01)	4 (0.83-1.07)	
Hospitalization	8 (0.78-0.99)	2 (0.74-1.13)	2 (0.66-1.28)	
ICU Admission	9 (0.71-1.11)	4 (0.64-1.39)	1 (0.43-1.53)	

Table 2. Risk of Positive SARS-CoV-2 Test Results, Hospitalization among Individuals with Positive SARS-CoV-2 Test Results, and ICU Admission among Patients Hospitalized With COVID-19 by Blood Type^a

Discussion

With contrasting reports from China, India, Europe, Boston, New York, and elsewhere, we embarked on a large, prospective case-control study that included more than 100000 individuals who were newly infected with SARS-CoV-2, and we found ABO associations with either disease susceptibility or severity. The smaller sample sizes and retrospective, observational nature of many prior studies, in addition to their striking heterogeneity of ABO associations with disease susceptibility and severity, could be due to chance variations, publication bias, differences in genetic background, geography and environment, and viral strains. The ABO gene is highly polymorphic, and ABO blood groups are distributed differently across ancestries and geographies. However, our results are similar among individuals of Indian population. Given the large and prospective nature of our study and its strongly null results, we believe that important associations of SARS-CoV-2 and COVID-19 with ABO groups are likely and will be useful factors associated with disease susceptibility or severity on either an individual or population level for similar environments and ancestries. Additional studies, closely controlled for genetics, geography, and viral strain, are required before accepting blood group as a determinant of predisposition to or severity of COVID-19.

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