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Distribution of ABO Blood Group System, Presentations, Comorbidities, Disease Severity and Outcome of COVID-19 Patients in Jashore, Bangladesh

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Abstract

Introduction: *The whole world has been crippled by COVID-19 for a long period of time and a lot of its issues still remain unknown. The study was designed to assess the distribution of ABO blood group system, presentation, comorbidities, disease severity and outcome of COVID-19 patients in Jashore, Bangladesh.*

Methods: *This retrospective type of observational study recruited 928 RT-PCR positive COVID-19 patients above 18 years living in the district of Jashore, Bangladesh.*

Results: *Mean age of the study population was 41.55±13.59 years including a significant age difference (p: <0.001) in disease severity and insignificant gender difference were observed (p: 0.291). Fever was frequently presenting symptoms (83.1%) in our study associated with cough 47.1%, fatigue 39.2%, myalgia 38.0%, distaste 35.3%, anosmia or hyposmia 33.3%. Diabetes (p: <0.001), hypertension (p: <0.001), chronic respiratory illness (p: <0.001), coronary artery diseases (p: 0.003) and malignancy (p: 0.003) played as potential risk factors for developing COVID-19 severity. Out of the total study patients, 36.9%, 29.1%, 22.5 and 11.5% COVID-19 patients came from blood B, O, A an AB respectively. On the other hand 95.5% COVID-19 patients were Rhesus positive. However, we did not found any significant association between disease severity and different ABO and Rh blood group (p: 0.379 and p: 0.092 respectively). A 97.6% of our patients had significantly (p: <0.001) been recovered from COVID-19 where most of the patients (81.1%) were managed at home. Though, 2% and 1.9% of our patients developed severe pneumonia and critically ill COVID-19, we had noticed significantly low mortality rate (1.4%, p: <0.001) in this current study.*

Conclusion: *In this recent study, blood group B constituted the highest number of the COVID-19 patients. Fever, cough and fatigue were the most common presenting feature of COVID-19 patients. Preexistent diabetes, hypertension, chronic respiratory diseases, coronary artery diseases and malignancy played as significant potential risk factors of diease severity of COVID-19. A majority of the patients were significantly managed at home. A minimum portion of the COVID-19 patients developed severe pneumonia and critical illness; and a significant low case fatality occurred in our study.*

Key words: *COVID-19, Clinical Profile, Comorbidities, Blood Group, Disease Severity, Outcome.*

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Introduction

SARS-CoV-2 infection was first detected in Wuhan city, Hubei Province, China in December 2019. Subsequently, the disease was nomenclature as COVID-19 which spread across the world and became pandemic.[1-3] According to the live update of Worldometer 612,754,605 people became infected and 6,512,838 people deceased by COVID-19 through the world whereas, 2,014,077 people became infected and 29,330 people died of COVID-19 by September 09, 2022 in Bangladesh.[4] Variable presentations including both respiratory and non-respiratory features by COVID-19 were reported.[5,6] Moreover, the disease severity and mortality of COVID-19 are thought to be directly related to advanced age, hypertension, diabetes, cardiovascular disease and chronic obstructive pulmonary disease, renal and hepatic diseases, and malignancies.[7] The mortality and morbidity of COVID-19 has been correlated with regional variations, ethnicity and various genetic factors.[8,9]

However, in respect to the case fatality of COVID-19, a number of raising hypothesis has been postulated to find out the relationship between the severities of COVID-19 and various exogenous and endogenous preexisting factors. Though the exact pathogenesis of morbidity and mortality by COVID-19 is not well understood but a lot factors including age, male sex and genetic factor play important role.[10.11] Therefore, several blood groups, by changing antigenic expression or serving as receptors and/or coreceptors, are directly related to modify host innate immune response to various infections (microorganism, parasites, and viruses). This is also believed that many blood group antigens take part in intracellular uptake, signal transduction, or adhesion through the organization of membrane microdomains. [12] With this hypothesis there was reported relationship between ABO blood group system and other viruses including HBV, SARS-COV, MERS-COV and Dengue.[13-16] Some recent studies noticed the association between ABO and SARS-CoV-2 infection, intubation, disease severity and treatment outcomes of COVID-19.[17-23] However, the further research is required to reveal the actual scenario of relationship between ABO blood group system and COVID-19. Moreover ABO blood group biomarker related to the disease severity and treatment outcomes of COVID-19 may be varied according to regional variation and ethnicity.

In term of these issues, we have conducted this study to assess the distribution of ABO blood group system, presentation, comorbidities, disease severity and outcome of COVID-19 patients in Jashore, Bangladesh.

Methods

- **Study Design, Duration and Settings:** The retrospective observational type of cross sectional study was carried out in the district of Jashore, Bangladesh dated from 10th August, 2020 to 10th September, 2020.
- **Study Population:** The positive RT-PCR for COVID-19 patients above 18 years aged who had known their blood group and given consent to participate the study were recruited in this current study. Positive patients did not know their blood group and below 18 years aged were excluded from the study. A total 928 eligible COVID-19 patients was enrolled in this study after meeting the entire inclusion and exclusion criterion.
- **Data Collection**: A preformed questionnaire was developed prior to data collection from the participants. We had invited our participants through telephone and mobile to complete the data sheet. The agreed participants of this study were requested to complete the case report form and send it to the assigned person.
- **Data quality control:** Each data was collected by the registered physicians and was cross checked by the every author by meeting virtually in every week during study tenure. After being cross checked by each author, data was locked in main data sheet.
- **Ethical Issue:** We had taken institutional approval from superintendent of 250 Bedded General Hospital, Jashore, Bangladesh. The participants were assured that their data and personal history would be stored by the principal author of this study; these would be used only for the research purpose and would not be handed over to any third party at any quest.
- **Covariates:** The following variables were used as covariates for analysis: age, sex, occupation, area

of residency, smoking [current smoking, non-smoker, ex-smoker (not smoked in the last 28 days)], became contact with the SARS-CoV-2 infected patients within the past 14 days, body mass index (BMI), presenting symptoms, underlying disease conditions, blood group, Rhesus factors, disease severity, management plan and outcomes of treatment. Age was categorized according to the decade. Occupation was categorized into seven groups including home maker, day laborer, student, business man, service, health care worker and unemployed. BMI was measured by weight in kilogram divided by height in meter square. We categorized BMI to the following groups: underweight (d"18.50), normal (18.6–25), overweight (25.1–30), and obese (>30). Disease severity was classified as asymptomatic, flu like illness, mild pneumonia, moderate pneumonia, severe pneumonia and critically illness including ARDS, sepsis and septic shock.[24] Patients management plan was categorized as home stay management, general ward management, high dependency unit management and intensive care unit management. Treatment outcomes was subdivided into recovery, referred and deceased.

- **Outcomes:** Our primary goal was to assess the distribution of ABO blood group system, presentation, comorbidities, disease severity and outcome of COVID-19 patients in Jashore, Bangladesh. In addition to these issues, we had demonstrated the role of demographic characteristics including age, sex, occupation, residency and BMI on the COVID-19 patients.
- **Patient and Public Involvement:** We have enrolled 928 RT-PCR positive patients of COVID-19 after acquisition consent either from participant themselves or from their legal guidance.
- **Statistical Analysis:** Analysis was carried out by using SPSS version 23. Categorical data was grouped as percentages and mean with standard deviation (SD) measured from continuous data. Chi-square test and independent sample T-test were used to extract p-value.

Results

Within the time frame of our study, a total 928 eligible patients were included where the mean age was 41.55±13.59 years with a male and female ratio was 2.5:1. Most of the patients developed influenza like illness (57.7%) and mild to moderate pneumonia (19.3%), whereas 19.1% COVID-19 patients remained asymptomatic. Age (p-<0.001), occupation (<0.001), smoking history (<0.001) and BMI (<0.001) had significant role on the disease severity of COVID-19 patients. In our study, 29.1% COVID-19 had single comorbidity and 12.1% patient had multiple comorbidities, hereby, presence of multiple comorbidities had significant role on developing disease severity (<0.001). Diabetes (<0.001), hypertension (<0.001), pre-existing respiratory illness (Asthma or COPD) (<0.001), Ischaemic heart disease (<0.003), pre-existing malignant condition (<0.003) were significantly associated with disease severity of COVID-19 patients. The effect of special condition pregnancy to the disease severity of a totally unknown virus SARS-CoV-2 was insignificant in our study (0.443) (Table-1).

Out of the total study patients, blood group B, O, A and AB constituted 36.9%, 29.1%, 22.5 and 11.5% COVID-19 patients respectively. Rhesus positive was found in 95.5% COVID-19 patients. We had not found any association of disease severity of COVID-19 patients with different ABO and Rh blood groups (p:0.379 and p:0.092). (Table-2). In our study, fever (83.1%) was the remarkable clinical features of COVID-19 patients in association other symptoms including cough (47.2%), fatigue (39.2) myalgia (38.0%), distaste (35.3%), altered smell (33.3%) and headache (30.0%) (Figure-1).

According to the management plan a significant portion of COVID-19 patients (81.1%) was managed at home. General ward management and high dependency unit management were required for 13.9% and 3.3% patients respectively. Only a minority of COVID-19 patients (1.6%) was required intensive care unit management in our study. A significantly high portion of the patients (97.6%, p:<0.001) recovered, only 1.0% patient was referred to the higher center for the further management. However, we reported only 1.4% COVID-19 patients were deceased in this current study (Table-3).

Table-1

Socio-demographic characteristics and Co-morbidity of all cases with disease severity (N-928).

Demographics, Smoking history, Body mass index (BMI) and Co-morbidity	Disease Severity					Total	P-value
	Asymptomatic	Influenza like- illness	Mild to Moderate Pneumonia	Severe Pneumonia	ARDS/ Septic Shock/ Sepsis		
Disease Severity, n (%)	177 (19.1)	535 (57.7)	179 (19.3)	19 (2.0)	18 (1.9)	928 (100.0)	
Age in years, mean±SD	38.31±14.95	40.57±12.73	44.55±12.02	52.47±15.47	61.22±11.50	41.55±13.59	<0.001
Gender, n (%)							
Female	49 (5.3)	157 (16.9)	50 (5.4)	5 (0.5)	1 (0.1)	262 (28.2)	0.291
Male	128 (13.8)	378 (40.7)	129 (13.9)	14 (1.5)	17 (1.8)	666 (71.8)	
Occupation, n (%)							
Unemployed/ Day labourer	14 (1.5)	29 (3.1)	13 (1.4)	4 (0.4)	6 (0.6)	66 (7.1)	<0.001
Student	29 (3.1)	39 (4.2)	7 (0.8)	0 (0.0)	0 (0.0)	75 (8.1)	
House makers	27 (2.9)	64 (6.9)	13 (1.4)	1 (0.1)	0 (0.0)	105 (11.3)	
Service	74 (8.0)	245 (26.4)	91 (9.8)	9 (1.0)	4 (0.4)	423 (45.6)	
Business	24 (2.6)	94 (10.1)	24 (2.6)	2 (0.2)	8 (0.9)	152 (16.4)	
Health-care worker	9 (1.0)	64 (6.9)	31 (3.3)	3 (0.3)	0 (0.0)	107 (11.5)	
Residence, n (%)							
Urban	124 (13.4)	367 (39.5)	135 (14.5)	14 (1.5)	11 (1.2)	651 (70.2)	0.433
Rural	53 (5.7)	168 (18.1)	44 (4.7)	5 (0.5)	7 (0.8)	277 (29.8)	
Smoking history, n (%)							
Non-smoker	152 (16.4)	395 (42.6)	134 (14.4)	14 (1.5)	10 (1.1)	705 (76.0)	<0.001
Ex-smoker	4 (0.4)	64 (6.9)	28 (3.0)	4 (0.4)	6 (0.6)	106 (11.4)	
Current smoker	21 (2.3)	76 (8.2)	17 (1.8)	1 (0.1)	2 (0.2)	117 (12.6)	
BMI in kg/m^2, mean±SD	23.9±3.8	25.1±3.6	25.7±3.7	26.7±4.6	25.1±2.5	25.0±3.7	<0.001
Co-morbidity, n (%)	55 (5.9)	194 (20.9)	103 (11.1)	14 (1.5)	16 (1.7)	382 (41.2)	<0.001
Single	47 (5.1)	139 (15.0)	69 (7.4)	8 (0.9)	7 (0.8)	270 (29.1)	<0.001
Multiple	8 (0.9)	55 (5.9)	34 (3.7)	6 (0.6)	9 (1.0)	112 (12.1)	
Specific co-morbidity, n (%)							
Diabetes Meletus	21 (2.3)	85 (9.2)	43 (4.6)	8 (0.9)	12 (1.3)	169 (18.2)	<0.001
Hypertension	23 (2.5)	114 (12.3)	57 (6.1)	9 (1.0)	10 (1.1)	213 (23.0)	<0.001
Chronic lung illness	7 (0.8)	23 (2.5)	26 (2.8)	2 (0.2)	3 (0.3)	61 (6.6)	<0.001
Ischemic Heart Disease	3 (0.3)	28 (3.0)	18 (1.9)	2 (0.2)	3 (0.3)	54 (5.8)	0.003
Chronic liver disease	1 (0.1)	3 (0.3)	4 (0.4)	0 (0.0)	0 (0.0)	8 (0.9)	0.285
Chronic kidney disease	1 (0.1)	2 (0.2)	3 (0.3)	0 (0.0)	0 (0.0)	6 (0.6)	0.429
Rheumatological disease	0 (0.0)	2 (0.2)	2 (0.2)	0 (0.0)	0 (0.0)	4 (0.4)	0.569
Cerebral-Vascular Accident	0 (0.0)	1 (0.1)	2 (0.2)	0 (0.0)	0 (0.0)	3 (0.3)	0.342
Malignancy	4 (0.4)	1 (0.1)	1 (0.1)	1 (0.1)	1 (0.1)	8 (0.9)	0.003
Pregnancy (as special condition)	3 (0.3)	4 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	7 (0.8)	0.443

Table II

Association of ABO Blood Group distribution and disease severity of COVID-19. (N:928)

Blood Groups	Disease Severity						
	Asymptomatic	Influenza like- illness	Mild to Moderate Pneumonia	Severe Pneumonia	ARDS/Septic Shock/Sepsis	Total	P-value
ABO							
O	51 (5.5)	148 (15.9)	55 (5.9)	7 (0.8)	9 (1.0)	270 (29.1)	0.379
A	50 (5.4)	113 (12.2)	38 (4.1)	5 (0.5)	3 (0.3)	209 (22.5)	
B	62 (6.7)	207 (22.3)	62 (6.7)	6 (0.6)	5 (0.5)	342 (36.9)	
AB	14 (1.5)	67 (7.2)	24 (2.6)	1 (0.1)	1 (0.1)	107 (11.5)	
Rhesus							
Positive	167 (18.0)	512 (55.2)	174 (18.8)	18 (1.9)	15 (1.6)	886 (95.5)	0.092
Negative	10 (1.1)	23 (2.5)	5 (0.5)	1 (0.1)	3 (0.3)	42 (4.5)	

Table III

Distributions of study subjects according to management and outcomes of COVID-19 (n:928)

Management procedure and outcome	Disease Severity						
	Asymptomatic	Influenza like- illness	Mild to Moderate Pneumonia	Severe Pneumonia	ARDS/Septic Shock/Sepsis	Total	P-value
Management procedure							
Home Stay Management	173 (18.6)	473 (51.0)	107 (11.5)	0 (0.0)	0 (0.0)	753 (81.1)	<0.001
General Ward Management	4 (0.4)	61 (6.6)	57 (6.1)	5 (0.5)	2 (0.2)	129 (13.9)	
High Dependency Unit (HDU) Management	0 (0.0)	1 (0.1)	15 (1.6)	9 (1.0)	6 (0.6)	31 (3.3)	
Intensive Care Unit (ICU) Management	0 (0.0)	0 (0.0)	0 (0.0)	5 (0.5)	10 (1.1)	15 (1.6)	
Outcome							
Recovery	177 (19.1)	532 (57.3)	177 (19.1)	13 (1.4)	7 (0.8)	906 (97.6)	<0.001
Referred	0 (0.0)	2 (0.2)	2 (0.2)	3 (0.3)	2 (0.2)	9 (1.0)	
Deceased	0 (0.0)	1 (0.1)	0 (0.0)	3 (0.3)	9 (1.0)	13 (1.4)	

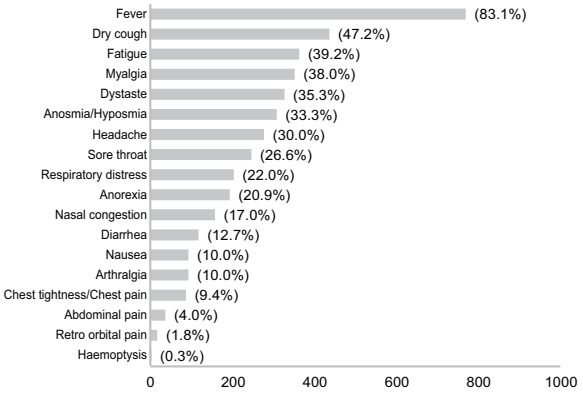

Fig.-1: *COVID-19 symptoms of all cases. (N:928)*

Discussion

The whole world is still observing disastrous situation of COVID-19, during writing this manuscript many countries have been reporting the second or third wave of this highly contagious disease. However, this study represents socio-demographic characteristics, co-morbidities, clinical presentations, frequency of disease severity, treatment outcomes, and finally correlation between ABO group and COVID-19 severity in Bangladesh. Like other studies, preexisting diabetes, hypertension, chronic respiratory diseases and coronary artery diseases reported the significant comorbid conditions of COVID-19 in our study.[2,5,6,7,8,10,11]

Clinical presentations of COVID-19 had been ranged from respiratory to non-respiratory symptoms. Even though, fever, cough, fatigue, myalgia, distaste, anosmia or hyposmia, headache and sore throat remained the prominent clinical presentations in our study like other studies.[2,5]

We have not found any exact distribution of ABO blood group and Rhesus grouping among the normal people in Jashore, Bangladesh. However, a large study conducted among blood donors in the central part of Bangladesh revealed 37.5%, 31.8%, 21.8% and 8.9% for B, O, A and AB respectively; and Rhesus positive and negative were 96.79% and 3.2% respectively.[25]

Distribution of ABO group in the study population of Jashore, Bangladesh had been shown 39.6%, 29.1%, 22.5% and 11.5% for B, O, A and AB respectively; and Rhesus positive and negative were 95.5% and 4.5% respectively, whereas the other studies have reported that blood group A people were more susceptible to COVID infection.[17,18,19,20] However, the other study has reported highest and lowest vulnerable to get COVID-19 infection among blood group of B and AB people respectively which is very similar to our study.[23] Though, B blood grouped people affected more frequently, but our study haven't found any significant relationship between disease severity and ABO group and Rhesus grouping like other studies.[17,19,20,23,25]

The current study had revealed that patients' age, occupation, history of smoking, high BMI and presence of underlying diseases were significantly associated with the severity of COVID-19. In our study we found 81.1% of the COVID-19 significantly managed at home level, 13.9% at general medical wards, 3.3% at HDU level and only 1.6% at ICU. High proportion of COVID-19 patients had significantly been recovered by our management. However, only 1.4% of our COVID-19 patients had been passed away in our study. Moreover, the death rate of our study was significantly lower than the national (Bangladesh- 1.61%) and worldwide (2.15%) death toll.[4]

Conclusion:

The current study concluded that more COVID-19 patients belonged to blood group B whereas low frequency of the patients from blood group AB. Common clinical presentations were fever, cough and fatigue. Significant risk factors of COVID-19 were preexistent diabetes, hypertension, chronic lung diseases, coronary artery diseases and malignancy. Home management was significantly adequate for the large portion of COVID-19 patients. A low frequency of COVID-19 patients became severely and critically ill and required HDU or ICU management. A significant low frequency of COVID-19 patients was deceased in our study.

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Competing Interest:

Authors declared no competing interest.

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