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Research Article

Overview of ABO-Blood Types and Mortality Outcome of COVID-19 Patients: An Observational Study in Bangladeshi Cohort

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Abstract

Background: The objective was to perceive the demographic characteristics, clinical symptoms, comorbidities, and biomarkers (hematological, inflammatory, hepatic, renal, and metabolic) of Intensive Care Unit admitted survivors and deceased patients with coronavirus and link with ABO system admitted to a tertiary level hospital in Dhaka, Bangladesh. Methods: It was a retrospective cohort, conducted in Holy Family Red Crescent Medical College Hospital, dedicated to COVID-19 at Dhaka, Bangladesh from 15th May to 9th September 2020. All 112 patients admitted to ICU diagnosed as COVID-19 cases (RT-PCR of the nasopharyngeal swab) were included in the study. Demographic data, prognostic biomarkers of 76 ICU patients were available and found from hospital records (non-electronic) and treatment sheets, and compared between the survived and deceased patients.

Result: Out of 76 cases, the male suffered more with a 1:2.8 ratio, the age range of 33 to 90 years. The mean age was 62.39 years. In total death and survival rate was 34.2% and 65.78% respectively. The majority of the 'A' group (27.27%) in <60 years and the 'AB' group (100%) in >60 years led to death. Dyspnea in survivors and in deceased SOB and fever were predominant, in the AB group. In survivors, Diabetes Mellitus was predominant comorbidity followed by Hypertension deceased ones suffered more from DM, HTN, and CKD (60%). Among the deceased ones, group 'O' (40%) had to undergo more to ventilators; 'AB' (50%) to HFNC, and NIV (20%). Significant anemia, leukocytosis, lymphopenia, neutrophilia, prothrombin time, serum creatinine, and raised ALT remained in deceased found in the present study.

Conclusion: Susceptibility of developing critical illness owing to COVID-19 was found more in male with >60 years. There were great range of variations in biomarkers in critical patients in different blood group that is a challenge to the health care workers to diminish the death rate in ICU in Bangladesh and globally.

Keywords: COVID-19; Blood group; Symptoms; Comorbidities; Biomarkers; Bangladesh

Introduction

The Novel Coronavirus Disease (COVID-19) is caused by an RNA virus (SARS-Co-V-2). SARS-Co-V-2 viruses (order Nidovirales, family Coronavirus disease, and subfamily ortho corona, are mostly spherical, approximately 125 nm in diameter, and with a spike which is nearly 9 nm to 12 nm forming the corona. Current research studies showed that Angiotensin-Converting Enzyme 2 (ACE2) is expected to be the COVID-19 cell receptor that can regulate the entry of the virus in the cell and the target tissue. Thus, spike glycoproteins occupy the viral envelope and the embattled membrane [1,2].

The disease course varies markedly among individuals, from mild or even subclinical infection to severe one. More than 1 million COVID-19-related demises has stated worldwide. Attention has drawn in impending endangerment which predispose to infection and disease development [3,4]. COVID-19, now regarded as a pandemic by the World Health Organization. The collective numbers to above 79 million cases and above 1.7 million deaths worldwide meanwhile the starting of the pandemic [5]. This vast number of cases infected with the new SARS-CoV-2 virus reveals the high contagiousness that outdid any community health catastrophe due to any solitary disease in human history [6]. The rates of infection and deaths all over the world have been upraised markedly. In China and Italy, at the outset, death ranging from 26% to 62% in critically ill patients. Whereas, in Seattle and New York, the death range varied from 23% to 50% correspondingly [7]. In the case of 80% of patients, SARS-COV-2 infections are self-limiting and special treatment may not require, 15% of the infected patients may have existent co-morbidities such as diabetes mellitus, ischemic heart disease, hypertension, and obesity are more probable to advancement severe pneumonia, get admitted to the health facilities with disease progression to get proper care and rest 5% progress to respiratory failure, Acute Respiratory Distress Syndrome (ARDS) and need Intensive Care Unit (ICU) support for a long period [8]. Increasing age and co-morbid disease have been reported as risk factors for death.

Landsteiner's ABO carbohydrate components are inherently gathered and former reports have proposed a link between ABO blood type, cardiovascular disease, and cancers, as well as typing and predisposition to certain infections, including SARS coronavirus [9-

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13]. In a study, it was stated a possible relationship between blood type A and a greater risk for COVID-19 infection and mortality even though blood group O was allied with a lesser risk of infection and mortality [9]. It was found that blood type A was interrelated with higher odds of testing positive for disease [14].

The present observational cross-sectional study intended to find out the effect of ABO blood grouping type on the vulnerability, symptoms, comorbidities, and biomarkers associated with the advancement of the disease between survivors and deceased COVID-19 patients of ICU.

Methods

This study was done on critical patients admitted in ICU of a tertiary care hospital from May 17 to September 9, 2020. It was a retrospective cohort study. The HFRCMCH was a 720-bed foremost non-Govt. Hospital with 9-bed ICU selected as "COVID-dedicated' by the Govt. of Bangladesh for four months. Total 76 severely ill patients (rt-PCR positive) were included. The present study was accepted by the designated hospital authority and institutional ethics board. The ICU cases were categorized into A, B, O, and AB groups. Demographic characteristics, symptoms, comorbidities, and biomarkers associated with the clinical progression of the disease were recorded in a pre-formed datasheet. Chi-square, one-way ANOVA test, and unpaired t-test were done by using SPSS version 26.0. All p values were two-tailed, with p <0.05 considered statistically significant with a 95% confidence interval.

Results

A total of 76 critically ill patients admitted ICU in Holy Family showed a total distribution of 23, 23, 25, and 5 in the A, B, O, and AB groups. The mean age was 62.39 years. Among them, 50 patients survived and 26 patients led to death with the mean age of 58.4 and 65.9 years. Male suffered more than 73.68% and the male: female ratio was 1:2.8 ranging from 33 to 90 years; mostly elderly males belonged

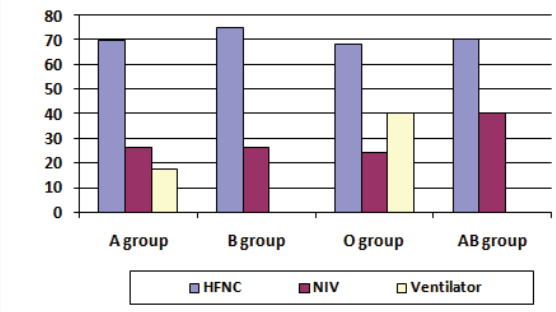

Figure 1: Requirement of instrumental oxygen supplement.

to >60-year age group. A sum of 34.2% died and 65.78% were survived. Among the survivors, 'A' and 'B' groups (69.56%) and among the non-survivors' 'AB' group (60%) were predominant. Mortality was more in the patients with 'A' group (27.27%) in <60 years and in 'AB' group (100%) in >60 years led to death depicted in Table 1.

Among the symptoms, SOB was the prevalent symptom in survivors (prevalent in 'A' group 60.86%), and in non-survivors SOB (60%) and fever (60%) was predominant in the AB group. All the symptoms were non-significant among groups (at p <0.5).

In survivors, diabetes mellitus was the predominant comorbidity and 'B' group (52.17%) suffered more. HTN leads the 2nd position, where patients with 'A' and 'B' group suffered more (43.47%). Patients of 'AB' group suffered more from DM, HTN and CKD (60%) in non-survivors. All these comorbidities were non-significant among groups. Other comorbidities like thyroid disease, bronchial asthma and other diseases were less common.

Among the deceased ICU patients, group 'O' (40%) had to undergone more to mechanical ventilator; group 'AB' (50%) undergone HFNC and group 'AB' got NIV (20%). Requirement of oxygen was non-significant (Figure 1).

Regarding the hematological markers Hb percentage was less in deceased in 'AB' group and was significant among different groups of alive patients. Total WBC count was highest in 'AB' group in alive and in 'O' group in deceased (significant among groups). Platelet count was lowest in 'B' group in survivors; in 'A' group in non- survivors only significant in deceased. Regarding lymphocyte and neutrophil count, it was low in 'O group (survivor and deceased) and only significant in deceased. On the other hand, HCT was lowest in 'B' group in alive and in 'AB' group in deceased patients, was only significant in deceased.

Only prothrombin time, serum creatinine and HbA1C were significant in deceased patients. Serum cholesterol and HDL were significant in survivors. All the other inflammatory, hepatic and important biomarkers were statistically non-significant (Tables 2-4).

Discussion

COVID-19 is an enduring pandemic throughout the world leading cause of devastating illness and death, notably grave for senile population with repeated comorbidities predispose to unembellished condition and eventually death as a result of SARS (severe acute respiratory syndrome) [15-19]. Male patients were in more critical condition in ICU with an age range of 1:2.8 compared to female and male survival rate were much higher, similar to other studies over the world. A study in Bangladesh on the admitted patients in ICU also showed 77.5%, 64.28%, 77% 16-19 and in Mexico 66.30%, about 65 % in USA [20,21]. The mean age of the survivors was 58.4 and deceased were 65.9 years accordingly, also alike to other studies done on critical ones and the age were above 60 years in maximum patients [16-18,22]. Among non-survivors, greatest number of patients belonged to 'AB' group (60%), alike in Canada where A and AB groups showed unadorned illness [23]. It was found that 'O' group may compromise some protection against COVID-19 infection. Researchers compared Danish Health Registry data of more than 4,73,000 persons tested for COVID-19 to data of a control group of more than 2.2 million people. Among the COVID-19 positive cases, fewer people were with 'O' and predominant persons were from 'A', 'B', and 'AB' group. People with blood group 'A' and 'AB' seems to reveal greater COVID-19 disease severity than people with blood group 'O' or 'B' [8]. People with type 'O' have a lesser ACE level, whereas type 'A' has positive relationship within ACE activity. The less amount of ACE enzyme can therefore diminish the possibility of HTN, strong threat for COVID-19 [24,25]. This is additional anticipated mechanism intended for evolving grave COVID-19 disease in type A and less severe disease in blood group O. While ACE2 can offset provocative reaction as well as redox stress and can counterpoise the ACE effect. People with type 'O' have also higher interleukin 6 (IL-6) levels, a pro-inflammatory cytokine which shows an important role in cell defense in the acute phase. Moreover, studies

Table 1: Demographic profile.

		A (23)	B (23)	O (25)	AB (05)	Total (76)
Survivors (50)		16 (69.56%)	16(69.56%)	16(64%)	2(40%)	50(65.78%)
Non-survivors (26)		7 (30.43%)	7(30.43%)	9(36%)	3(60%)	26(34.21%)
Age Range						
Survivors (27)	<60 years	72.72%	83.33%	85.71%	100%	27(81.81%)
Non-survivors (6)		27.27%	16.16%	14.28%	-	6(18.18%)
Survivors (23)	>60 years	66.66%	64.70%	14.14%	-	23(53.48%)
Non-survivors (20)		33.33%	35.29%	63.63%	100%	20(46.51%)

Table 2: Haematological biomarkers.

		A (n= 23)	B (n= 23)	O (n= 25)	AB (n=05)	Statistical values
Hb%	Survivors	12.67 ± 1.78	12.06 ± 1.2	13.51 ± 1.68	12.85 ± 2.89	p=0.022976*
	Non-Survivors	11.92 ± 3.64	11.54 ±12.21	13.12 ± 2.1	10 ± 1.3	p =0.035661*
Total WBC	Survivors	9.87 ± 4.2	7.74 ± 3.02	10.29 ± 5.09	14.7 ± 0.98	p =0.350042ns
	Non-Survivors	9.88 ± 3.93	8.74 ± 2.74	13.43 ± 3.01	12.76 ± 3.34	p=0.035983**
Platelet	Survivors	311.9 ± 124.2	237.6 ± 87.0	351.8 ± 141	310 ± 22.6	p=0.026304*
	Non-Survivors	252 ± 84.122	275.8 ± 108.6	287 ± 74.18	342 ± 89.4	p=0.517486ns
Lymphocyte	Survivors	17.75 ± 8.26	20.37 ± 9.98	15.87 ± 9.57	16 ± 4.24	p=0.615499ns
	Non-Survivors	9 ± 5.57	16.86 ± 20.99	9.1 ± 6.64	10.3 ± 4.61	p=0.001933***
Neutrophil	Survivors	77.59 ± 8.44	74.94 ± 11.36	79.62 ± 10.85	78.5 ± 2.02	p=0.058321ns
	Non-Survivors	86.28 ± 6.34	80 ± 89.85	88.2 ± 5.58	87 ± 2.65	p=0.028815*
HCT	Survivors	39.43 ± 4.33	38.08 ± 3.79	41.7 ± 5.33	41.2 ± 8.62	p=0.084129ns
	Non-Survivors	42.3 ± 4.5	36.39 ± 39.07	40.3 ± 5.94	31.4 ± 3.12	p=0.025621*

Table 3: Inflammatory Biomarkers.

		A (n=23)	B (n=23)	O (n=25)	AB (n=05)
d-Dimer	Survivors	1.105 ± 0.85	1.188 ± 1.99	0.522 ± 0.89	1.095 ± 0.95
	Non-Survivors	1.022 ± 1.15	1.614 ± 2.18	0.78 ± 0.86	1.25 ± 1.48
CRP	Survivors	32.44 ± 23.12	32.63 ± 29.53	30.75 ± 18.97	38 ± 14.14
	Non-Survivors	36 ± 28.56	22.28 ± 66.6	30.6 ± 29.3	42 ± 47.63
Ferritin	Survivors	782 ± 574.55	718 ± 634.75	713 ± 395.53	547 ± 448.3
	Non-Survivors	1218.86 ± 1019.41	1006.66 ± 964.39	994.7 ± 780.5	510 ± 279.04

Table 4: Hepatic biomarkers.

		A (n=23)	B (n=23)	O (n=25)	AB (n=05)
SGPT	Survivors	52.9 ± 5.86	52.6 ± 14.85	31.7 ± 10.11	83 ± 12.73
	Non-Survivors	86.9 ± 1.272	55	78	-
PT	Survivors	15.56 ± 3.07	15.35 ± 1.91	15.09 ± 1.89	14.85 ± 2.62
	Non-Survivors	15.96 ± 2.35	16.2 ± 1.1	21.3 ± 13.14	16.7 ± 2.4
INR	Survivors	1.26 ± 0.73	1.22 ± 6.54	1.18 ± 0.15	1.14 ± 0.19
	Non-Survivors	1.208 ± 0.170	1.24 ± 0.084	1.72 ± 0.98	1.27 ± 0.20
APTT	Survivors	44.69 ± 8.85	44.02 ± 0.15	46.46 ± 9.18	40 ± 7.07
	Non-Survivors	53.2 ± 12.74	50.82 ± 18.23	50.2 ± 12.13	46.3 ± 7.73

showed that IL-6 is accompanied by severe COVID disease as well as shows defensive part in lung healing rejoinders [2,26-30].

SARS- COV2 typically presents almost alike to other respiratory viruses including fever, cough, fatigue, diarrhea, and vomiting, with radiographs showing invasive lesions in the respiratory system. Few people presented with serious complications such as ARDS or shock [25]. Among the symptoms, SOB and fever was prevalent in deceased, prevalent in 'AB' group 60% and in survivors ('AB' group 60.86% and 'B' group 52.17%). All the symptoms were non-significant among groups (at p<0.5). In a similar study, clinical manifestations were fever in 63.2%, SOB in 41.6% out of 490 subjects [31].

In non-survivors, the prevalent comorbidities were diabetes mellitus, HTN and CKD (60%) that was more frequent in 'AB' group. In survivors, DM was more in 'B' (52.17%) and HTN leads the 2nd position in 'A' and "B' (43.47%) group; and CKD in 'A' group (8.69%). Similar findings were observed where DM (41%) and HTN (68.9%) were common in 'AB' group [32]. In a similar study, group 'A' suffers (58.2%) and 'B' group (61.7%) from HTN. It was found that CKD was 16.8% in group 'A' [32]. All the comorbidities were non-significant among groups. Thyroid disease, bronchial asthma and other diseases were less common.

Among the non-survivor ICU patients, group 'O' (40%) had to undergone more to mechanical ventilator; group 'AB' (50%) undergone HFNC and group 'AB' got NIV (20%). Requirement of oxygen were non-significant among different blood groups. Conversely, in Canada a study on 95 ICU patients diagnosed as SARS-CoV2 has reported that type A or AB were more prone to intubation, ominous that lung injury from COVID-19 results from them had greater degrees. Similarly, type 'B' and 'AB' shows slightly higher risk compared to 'O' for intubation [33,34].

The most unpredictable predictors of the COVID-19 patients range from hematological markers to inflammatory and immunological biomarkers until today. Regarding the hematological markers Hb percentage was less in deceased in 'AB' group and it was significant among different groups of alive and deceased. Severity of SARS-CoV2 has a possible link of anemia [35]. Total WBC count was highest in 'AB' group in survivors and in 'O' group in non-survivors (was significant among groups). Regarding lymphocyte

and neutrophil count, it was low in 'O in survivors and deceased and only significant in non-survivors. Severity of SARS-CoV2 may be an outcome of leukocytosis and lymphopenia. According to current study showed that lymphopenia with leukocytosis was associated by serious COVID-19 [36,37]. In some communicable diseases like influenza, previously lymphopenia had a predictive role. Unswerving infection of lymphocyte, destruction of lymphatic tissue, lymphocyte apoptosis due to inflammation or some metabolic abnormalities for instance lactic acidosis causing lymphocytes inhibition may correlate relationship amid lymphopenia and severe disease [38]. Platelet count was lowest in 'B' group in survivors; in 'A' group in deceased only significant in non-survivors. HCT was lowest in 'B' group in alive and in 'AB' group in deceased patients, was only significant in deceased.

Only prothrombin time, serum creatinine and HbA1C were significant in deceased patients. Present study showed higher levels of ALT and significant serum creatinine. In a similar study, among 95 ICU patients, ALT (p=.01), and creatinine (p=0.03) were lower in 'O' or 'B' patients compared to 'A' or 'AB' patients. Raised ALT, and peak serum creatinine in type 'A' or 'AB', which may design a tea multi-organ defensive effect deliberated by the anti-A antibody or other factors like Von-Willebrand factor; these data align with the multi-organ association of SARS-CoV-2 infection [39]. Serum cholesterol and HDL were significant in survivors. Other biomarkers were non-significant.

The present study showed few precincts. A small number of cases were included. The laboratory values were collected on admission and the subsequent reports and changes in parallel to the medical ailment of the cases were not assessed.

Conclusion

The Novel SARS-CoV-2 is presenting with various strains, clinical presentation and disparities in biomarkers with terrestrial multiplicity in different blood group. Males with >60 years are predominantly affected and present with SOB and fever and DM, HTN were the common comorbidities in both alive and deceased in AB, B and A group. The predictor of severity, evolution and high mortality in ICU admitted patients require empiric scrutiny. Therefore, early predictors of severity should be found out for active treatment and save the critical ICU patients is a crying need in our low-middle wages country.

Author's Contribution

Tahmina Zahan: conceived and designed analysis, contributed analysis tool, performed analysis, wrote the paper

Morshed Nasir: conceived and designed analysis, collection of data, performed analysis. AQ Shohag: contributed analysis tool. Rawshan Ara Perveen: Data collection, contributed analysis tool. Sayma Parveen: contributed analysis tool

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