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Association of blood groups with coronavirus disease (COVID-19)

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ABSTRACT

BACKGROUND & OBJECTIVE: Coronavirus (COVID-19) disease emerged acutely and suddenly, becoming a nightmare as it affected every country drastically. This disease engulfed the physical, mental as well as social lives of the individuals. The objective was to determine which blood group has a higher tendency to contract COVID-19 infection and to evaluate common presenting symptoms

METHODOLOGY: This cross-sectional study was performed from August to September 2020 at Aziz Fatima Medical and Dental College, Faisalabad. A structured questionnaire was formed on a Google form. It was then conveyed through sharing link by WhatsApp among the COVID positive patients. Data was compiled and analyzed by SPSS 22.

RESULTS: Our study comprised 415 subjects of age 20-50 years who got COVID-19 infection. Out of which 162(39%) comprise the male population and 253(61%) constituting of female population. Subjects of the age group of 20 to 30 years were most frequently infected with COVID-19. Our results reveal that COVID-19 was more among blood group B followed by O, AB & A. The most frequent symptom from which the subjects suffered was fever 305(73.4%) followed by smell and taste alteration comprising 180(43.3%), 154(37%) subjects suffered from sore throat. GIT symptoms were reported by 50(12.0%) while only 102(13%) remained asymptomatic.

CONCLUSION: We conclude that COVID-19 was more prevalent among blood group B followed by O, AB, A, and the Rh-positive group. The most frequent symptom in our study was fever, followed by loss of taste and smell sensation.

KEYWORDS: Blood Group antigens, COVID-19, Fever.

INTRODUCTION

Coronavirus disease (COVID-19) pandemic has become a serious health crisis due to its unusual pattern of spread. COVID-19 was first reported in Wuhan, Hubei province of China, which eventually led to a global pandemic [1]. In December 2019; it was informed to World Health Organization (WHO) as lethal pneumonia affecting individuals with unknown microbial etiology in Wuhan city. Later on, the WHO announced the detection of a novel coronavirus, SARS-CoV-2 from the blood samples of affected patients and declared COVID 19 as a devastating pandemic that escalated rapidly and badly shaken the entire world's health system [2].

This health organization also announced it as a public health emergency of international concern. Effected individuals reported a varying range of Clinical presentations, from the common cold to severe pneumonia like symptoms that can even prove fatal. Common characteristic symptoms common cold like symptoms include fever, fatigue, cough and shortness of breath which might lead to smell and taste alteration [2].

Though some asymptomatic cases with positive coronavirus were also evident [1].The previous two waves of this serious pandemic engulfed millions of people across the whole world but appearance of the third wave have proven even more serious than previous waves and impact negatively on public health at a massive scale as more people victimized by this virus variant as compared to previous two waves [3]. Ding to WHO dashboard till 28th November 2020, there have been 61,299,371 confirmed cases of COVID-19, including 1,439,784 deaths globally and 389,311 confirmed cases of COVID-19 with 7,897 deaths from Pakistan were reported to WHO [4].

Many queries are still debatable due to the sporadic nature of the resurgence of COVID-19 infection [5].

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Evidences of rapidly diminishing antibody levels have raised alarms that immunity against SARS-CoV-2 could decline within weeks of recovery from infection [3].Cases of reinfection have been reported from China, the Netherlands as well as Pakistan [6,7]. Screening of the whole population is very difficult for countries with limited sources of preventive measures and treatment. So it is necessitating identifying the most vulnerable group for infection as well as reinfection with lethal coronavirus. Researchers, especially from China, are focusing on establishing the relationship between ABO blood groups and COVID-19[8].

Some researchers have reported the relationship of ABO blood group with coronavirus diseases [8,9] however, but this theory is not yet well established due to limited data availability globally. Hence, it is a matter of scientific concern across the world to elucidate which blood group individuals are more prone to contract COVID-19 infection to identify the population at risk. Vaccination of recognized vulnerable populations on priority bases will help in the effective prevention of disease, particularly in areas with limited resources.

There is still a paucity of data concerning this association from Pakistan, so we are trying to explore the subjects of which blood group were more affected from Pakistan. We also tried to seek common clinical presenting complaints of corona-infected subjects. Our research helps in adding the literature concerning this association from Pakistan and will open the horizon for Pakistani researchers to do a similar study on a broader scale with more protocols. Recognition of high-risk populations might help in reducing the heavy burden of this disease on governments with utilizing available limited resources on subjects at risk.

METHODOLOGY

This current cross-sectional study was performed from August to September 2020. After obtaining Ethical approval from Institutional Ethical Committee (Reference No. 1EC/25/20) at Aziz Fatima Medical and Dental College, Faisalabad. An online structured questionnaire was prepared on Google form, and a link was shared via WhatsApp among the COVID-19 positive subjects (confirmed by test) from the general population of various cities in Pakistan. Individual anonymity and confidentiality was assured of maintaining. Data was collected by non-probability convenient sampling from all across Pakistan. Though most of the participants were from Karachi, showing it as the most affected region of Pakistan in real time, and Faisalabad from where the study was conducted.

A proper questionnaire was developed by searching literature concerning COVID-19. Since the general public's routine social activities are suspended, they are required to observe social distancing and restricted movement due to lockdown, home isolation, and quarantine. So, in light of the current scenario, data were collected through an online self-reported data collection tool.

Participants were provided with detailed information about the questionnaire, objectives and purpose of the study before filling out the proforma.

The questionnaire had two parts. In the first part, a participant had to consent only then they could access the second part of questions related to demographic data, blood groups, the impact of COVID-19 pandemic on themselves, COVID-19 related symptoms, oxygen saturation, adoption of best practices concerning preventative measures including the use of mask, social distancing, and frequent hand washing etc.

A minimum sample size of 389 COVID-19 positive subjects was set. The sample size was calculated using an internet calculator with a population of active 389,311 COVID-19 patients in Pakistan according to the latest statistics (at the time of writing article) from WHO dashboard, confidence interval of 95% and error 5%, and power 80 [4,10] Google form link was sent to 450 subjects initially. However, only 415 participants responded and filled out the complete proforma and were included in the study. Subjects who did not fill proforma completely were excluded from study. The data was compiled and statistically analyzed using SPSS software version 22. Categorical data is presented in counts and percentages. Statistical significance was tested by the Chi-square test. p-value<0.05 was considered statistically significant.

RESULTS

Our study comprised 415 subjects of age 20-50 years who got COVID-19 infection. Out of which 162 (39%) comprising of male population and 253(61%) constituting of female population. Subjects with the age group of 20 to 30 years was the most frequent age group, contracting COVID-19 infection 186(44.8%). Our results reveal that COVID-19 was more prevalent in blood group B followed by O, AB & A, as shown in Table-I. Out of the total subjects, 240(57.8%) were confirmed COVID-19 positive on nasophyrngeal swab, followed by orophyrngeal 105(25.4%) and 70(16.8%) were got positive immunoglobin on blood tests, figure-I.

The most frequent symptom subjects suffered from was fever 305(73.4%) followed by smell and taste alteration comprising 180(43.3%), 154(37%) subjects suffered from sore throat. GIT symptoms were reported by 50(12.0%) While only 102(24.6%) remained asymptomatic. The majority of the population with blood Group B were found to be more symptomatic, followed by O and A, the least symptoms were observed in subjects with blood group A (p=0.024). Concerning the rhesus blood group, we observed more symptoms in rhesus negative Covid subjects as compared to Rh-positive subjects however, the difference was not found to be statistically significant (p-value= 0.184), table-II.

While 313(75.4%) subjects contracted infection despite of using precautions while 102(24.6%) figure-II, subjects didn't follow any precautions for COVID-19 infection. Large population group, 390(93.9%) used masks, followed by hand sanitization, 230(55.4%) and 200(48.1%) followed social distancing. While comparison among genders about adopting of precautions, we found that females 208(82.2%)

are less apprehended for following the precautionary measures than the male population 135(83.3%).

Surprisingly, it was found that males though following vigorous precautionary measures than females, were found to be more symptomatic, 132(81.5%) vs 181(71.5%) respectively, with (p-value= 0.02).

Table-I: Corona positive patients among blood groups (n= 415).

ABO Blood Groups	Corona Positive Frequency (%) n= 415
A	54(13)
B	172 (41.4)
AB	63(15.2)
O	126 (30.4)
Rhesus Blood Group	
Rh-positive	322(77.6)
Rh-negative	93(22.4)

Table-II: Association of COVID-19 symptoms with blood groups.

Symptoms	Blood group-A n(%)	Blood group-B n(%)	Blood group-O n(%)	Blood group-AB n(%)	p-value
Yes	45(83.3)	136(79.1)	93 (73.8)	39 (61.9)	0.024
No	9 (16.7)	36(20.9)	33 (26.2)	24 (38.1)	
	Rhesus Positive		Rhesus Negative		
Yes	238 (73.9)		75(80.6)		0.18
No	84(26.1)		18(19.4)		

p-value≤ 0.05 taken as significant.
Association determined by chi-square test.

DISCUSSION

Global dissemination of the third wave of COVID-19 is escalating rapidly and has affected the major population with massive morbidity and mortality globally [3]. Coronavirus outbreak put strained on testing resources and health care providers, making the identification and prioritization of subjects that are most at-risk and has become a critical challenge. Most probably, it is due to false negative and positive test leading to under or over diagnosis.

That is why COVID-19, nowadays gaining immense attention of researchers to find corona-associated risk factors. Previous studies also implicated the involvement of ABO blood groups in COVID-19 susceptibility and its severity [10].

This study was designed to explore the association of blood groups with Covid-19 infection. High-risk individuals can be vaccinated on a priority basis to curb the burden of this devastating disease, especially in countries with limited availability of vaccines.

We also tried to seek the frequent symptoms of the affected who suffered from the disease. Current results indicated that the subjects with blood group B followed by O are contracting the disease more frequently than the other blood groups. Subjects with AB and A blood groups are least likely to contract corona infection. Our results are in line with the study conducted in Peshawar, that noted a high proportion of COVID-19 disease in subjects with blood group B[11].

Inconsistence results were reported by another Pakistani study from Rawalpindi, documenting a higher risk of COVID-19 among blood group A followed by B and a lower risk among O blood types [12]. Current results are in accordance with the study conducted in Massachusetts, United States, that reported blood group B had the highest frequency of COVID-19 however, the finding related to blood group O appears against our study, as they reported the lowest frequency of COVID-19 among blood group O subjects and we found it as second common blood group susceptible for COVID-19 infection [13]. In contrast to it, a previous study conducted in Lahore by Bari et al. reported that blood group "O" was most prevalent blood group for COVID [14].

Contrary to our results, many studies suggest that those with blood type A may be more susceptible to viral infection [8,9,15,16]. Most probable reason explained by Fan et al and Ayatollahi et al was that angiotensin-converting enzyme 2 (ACE2) is the main host cell receptor of SARS-CoV-2 and

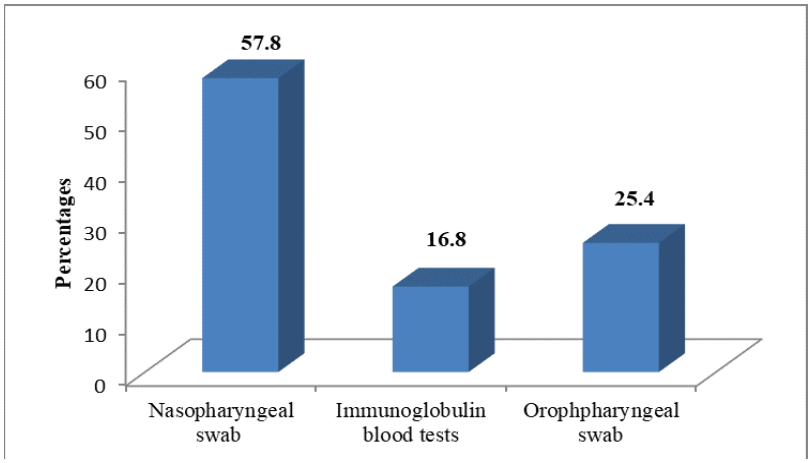

Figure-I: Confirmatory Tests Adopted By Subject For COVID-19 diagnosis (n=415).

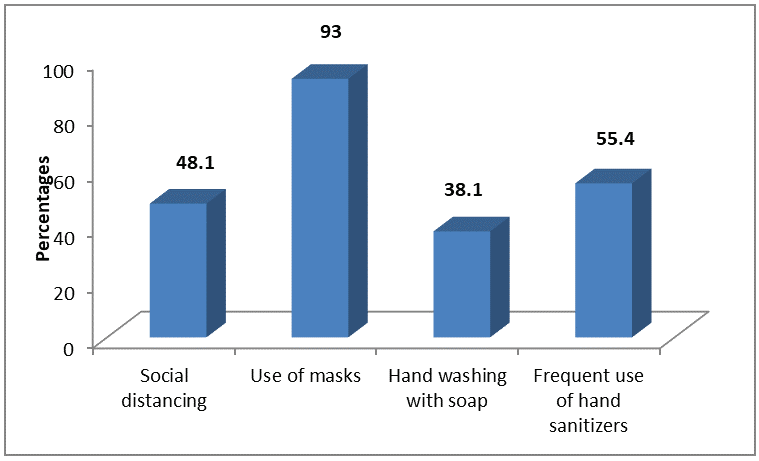

Figure-II: Preventive measures adopted by COVID-19 patients (n=415).

plays a crucial role in the entry of the virus into the cell by interacting with its transmembrane "spike (S) proteins" to cause infection.

It is evident by previous studies anti-A antibodies block this interaction and prevent COVID-19 infection. Lacking anti "A antibody" in "A" blood group A is making this blood group more prevalent for COVI-19, and presence in blood group "O" make it protective against COVID-19 [15,16]. However, this explanation is against our finding as the more prevalent blood group B in our study also have Ant –A antibody. Moreover this justification is also against the Bari et al. study from Lahore, suggesting that subjects with blood group type O were more susceptible to viral infection [14]. So the underlying mechanism between the ABO blood groups and ACE2 host cell receptors needs to be further explored. Our findings concerning Rhesus (Rh) blood group and its relation of COVID-19 are in concordance with other previous study conducted in china and the United States, all which documented that Rh-positive blood is more prevalent group for COVID19 disease [8,9,13], however, latest study from Pishawar has reported that subjects with Rh-D positive blood group are less susceptible to COVID-19 [11]. The discrepancies in the results of different studies from the various regions concerning susceptibility of COVID-19 in blood groups may be due to genetic makeup and differences in susceptibility to various strains of viruses which may vary among different ethnicities and races. Furthermore, variation between blood group phenotypes in countries and different genetics may affect the heterogeneity of COVID-19 clinical phenotypes[11,16].

Most frequent symptoms in our study was fever followed by taste and smell loss, sore throat, which is supported by the study carried out at Wuhan China. The least presented symptoms in our study were GIT symptoms, only 12.8% of the affected subjects suffered from GIT symptoms, china also reported GIT as the least common presenting symptom in subjects suffering from COVID-19. However, only 4.9% of Chinese COVID-19 subjects presented with GIT complaints [17]. Contrary to it, taking GIT as a minor clinical presentation, another Chinese study from Hubei reported 48% of GIT symptoms, showing it as one of the major symptoms [18]. In our study, symptoms were more frequently found in blood group A, followed by B, O, and AB, respectively. Concerning rhesus blood group, we observed more symptoms in rhesus-negative Covid subjects as compared to Rh-positive subjects. Our results are in accordance with the study conducted in Lahore and Iran, reporting the association of the severity of disease with blood group A[14,16].

These findings are also justified by the latest study by Bshaena from Libya, reporting that the Patients with the type A blood group are more prone to develop severe SARS-CoV-2 infection with bed outcomes, whereas patients with the type O blood group have a lower risk of developing severe SARS-CoV-2 infection [19]. In our study, male subjects were victomised by this deadly disease more than female subjects. Our results are in agreement with Jin et al. study, indicating that male subjects are more susceptible for contracting this virus [20]. These results are also in accordance with Chinese studies demonstrating male predominance for contracting infection [21,22]. A recent study from Libya is also in favor of our study and reported that the majority of the male patients with severe COVID-19 [19]. In contrast to this Iranian study did not find any significant association between gender and COVID-19 [16]. In contrary to all studies, another study has reported that female patients are susceptible to COVID -19 [15]. It is evident that female tend to have a more responsive immune system compared to men so that the outcome and survival rates from infections are better in females than in males [23]. Estrogen which is the primary female sex hormone has been observed to play a protective role in SARS not only by activating immune response but also by suppressing directly SARS-CoV replication[24]. Estrogen have anti-viral, anti-inflammatory, and anti-oxidative effects properties [25,26].

Similarly proper Knowledge, discussion of correct information and practices are required to cope up with COVID-19 [27,28].

Future studies on a broader scale for eluding the underlying molecular basis that makes people more or less susceptible to developing severe SARS-CoV-2 according to their ABO

blood groups and gender differences are required, which will help us to understand and ascertain the correlation.

CONCLUSION

COVID-19 was more prevalent among blood group B followed by O, AB, A, and Rh-positive groups. The most frequent symptoms in our study was fever followed by taste and smell loss.

LIMITATION: It was a cross-sectional study, and because of the small sample size, results may not be generalized to the whole population.

Strength of study and Recommendations:

Current results are similar to international studies is the strength of the study. The collection of data from various cities of Pakistan involving patients from all over Pakistan using internet applications is also a strength of this research.

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CONFLICT OF INTEREST: None.

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Author's Contribution:

Shireen Jawed: Substantial contributions to the conception and design of the work.
Benash Altaf: Drafting the work and revising it critically for important intellectual content.
Hania Ali: Data collection, study design, manuscript drafting, data analysis, manuscript approval.
Hira Zahid: Acquisition, analysis, and interpretation of data for the work.
Anam Rehman: Data collection and manuscript writing.

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