

Immunological, Serological and Hematological Changes in COVID-19 Patients of Dhaka City

Short Communication

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ABSTRACT

The analytical test reports of COVID-19 patients admitted in two major hospitals in Dhaka City were analyzed to observe the immunological, serological and hematological abnormalities that can be significant for managing the patients in emergencies. The observed levels of ferritin, procalcitonin, D-Dimer, C-reactive protein (CRP), creatinine and alkaline phosphatase (Alk_p) were taken into consideration for this study. Though these parameters were elevated as mentioned for patients from many other countries, in significant cases, the values were normal or even lower than the normal levels. The ferritin level was normal (For men, 24 to 336 micrograms per liter. For women, 11 to 307 micrograms per liter) in only 30% of the patients, whereas, 50% of the patients had higher values and 20% patients had the lower values. Similarly, the procalcitonin (normal value 0.1 to 0.5 ng/mL) level was found to be normal in only 27% of the patients while remaining 73% patients had the high level of this parameter. The D-Dimer level (less than 0.50) was also found to be normal in only 27% of the patients, whereas 72% of the patients had the higher levels. The C-reactive protein was within the normal level in only 22% of the patients, whereas, 76% of the patients had the high level of this marker. The creatinine was found to be increased in 60% of the patients. There were 88% patients having increased levels of Alk_p with only 12% patients having normal levels. Thus, the elevations of the immunological, serological and hematological parameters were somehow different from those observed from patients in other countries. This information might be useful in managing the hospitalized COVID-19 patients in our country.

Keywords: *Immunology, Serology, Hematology, COVID-19*

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The corona Virus disease 19 (COVID-19) has been appeared as a highly communicable pathogenic infection in recent years. The severe acute respiratory syndrome corona Virus 2 (SARS-CoV-2) is the causative organism of this disease (Shereen *et al.*, 2020). This infectious disease has put a catastrophic effect on the healthcare system worldwide by resulting in more than 6 million deaths. Considering the severity of the resulting global crisis, World Health Organization (WHO) was to declare the situation as a global pandemic on March of 2020 (Sharma *et al.*, 2021). This is a RNA virus having capacity of genetic evolution leading to development of mutant variants having characteristics different from the parent strains. Thus, the global mass vaccination against this infection gave limiting success in many countries. Even this COVID-19 infection has appeared as the major cause of death in many countries. As for example, the COVID-19 was appeared as the third leading cause of death in United States (USA) in 2020 and caused approximately 375,000 deaths in that area (Ahmad *et al.*, 2021). The mutant variants also resulted in varying degrees of morbidity and mortalities in different regions of the world. Accordingly, studies also showed that the people of Black, Hispanic, and Asian ethnic minority groups are at increased risk of contracting and dying from COVID-19 infection (Sze *et al.*, 2020).

Among the various factors causing death in COVID-19, the cardiac involvement is the most common. There is direct cytotoxicity to the myocardium leading to myocarditis, vascular inflammation and cardiac arrhythmias (Huang *et al.*, 2020). These effects are ultimately life-threatening and demands immediate hospitalization and medical supports to save the life. These supports can be significantly aided by the laboratory tests for related immunological, serological and hematological abnormalities of varying degrees depending on the severity of the infections. Though these types of data have been published (Henry *et al.*, 2019; Ponti *et al.*, 2020;

Guan *et al.*, 2020; Liu *et al.*, 2020; Moon *et al.*, 2020) from patients of various countries, these are not that much available from patients of Dhaka City. This study focused on the patients from two major hospitals in Dhaka City to find out the immunological, serological and hematological abnormalities that can be significant for managing the patients in emergencies.

The study was conducted by taking blood test reports from the patients admitted in Kuwait Bangladesh Friendship Government Hospital and Popular Diagnostic Center Ltd. located in Dhaka city. Immunological, serological and hematological reports of patients (n=103) admitted for COVID-19 were collected. The randomly collected test reports included patients of all ages having 74% adults (12-60 years), 22% elderly (> 60 years) and 4% children (<12 years). Both the male (71%) and female (29%) were included in the study. Several indicators are usually considered for assessing the condition of COVID-19 patients. One of these is the D-Dimer which is a by-product of the blood clotting and break-down process (Michel *et al.*, 2018; Ryu *et al.*, 2019; Payus *et al.*, 2019). This protein, indicating presence of clot in the body, can be measured by analyzing the blood sample. Ferritin is another important factor mediating the immune dysregulation by direct immune-suppressive and pro-inflammatory effects leading to the cytokine storm (Abbaspour *et al.*, 2014). Similarly, Procalcitonin, a precursor of the hormone calcitonin, has been reported (Wang *et al.*, 2020) to be positively associated with the severity of COVID-19. C-reactive protein (CRP), a non-specific acute phase protein produced by hepatocytes, has been found to be elevated in acute infection or inflammation (Stringer *et al.*, 2021). Increasing evidences also indicate that COVID-19 is accompanied by renal dysfunction and hepatic dysfunction (Xiang *et al.*, 2021; Fei *et al.*, 2008). Thus, these vital factors have been taken for assessing these hematological and immunological parameters in patients in Dhaka City. The analytical

reports have been collected and the recorded levels of ferritin, procalcitonin, D-Dimer, CRP, creatinine and alkaline phosphatase (Alk_p) were taken for this

study. The data were analyzed by using Microsoft Excel 2016.

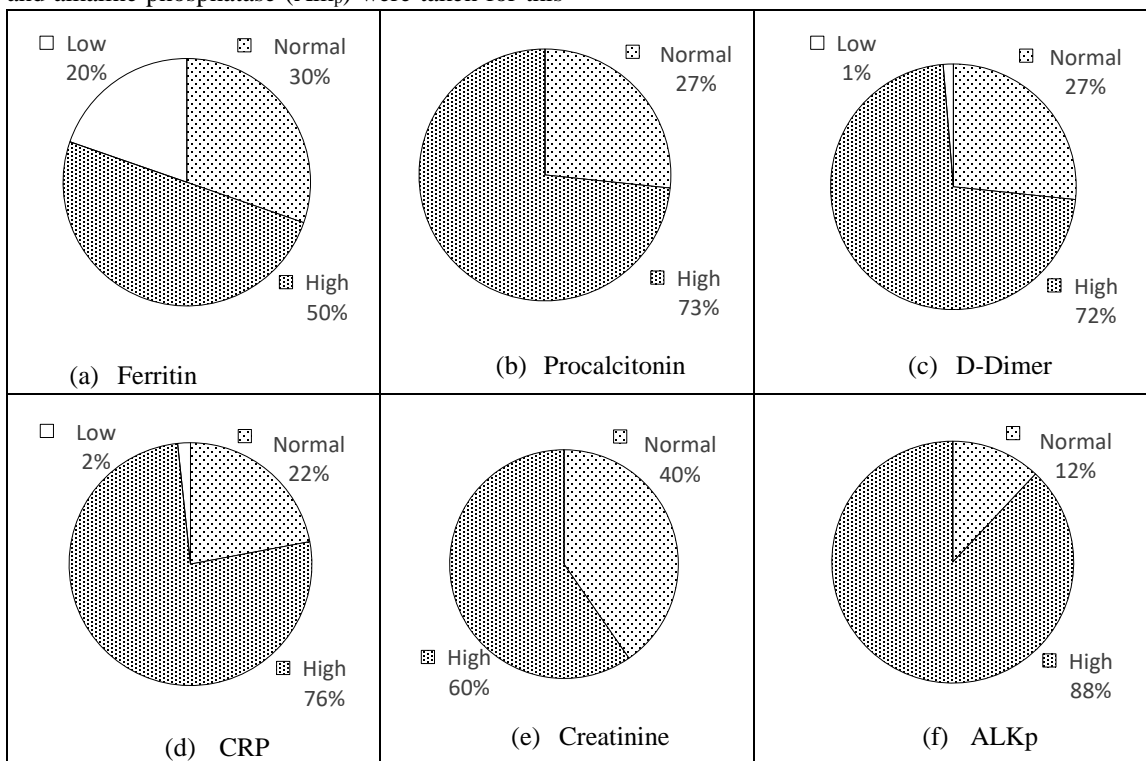


Figure 1: Levels of various serological, hematological and immunological parameters found in COVID-19 patients in Dhaka City

As shown in figure 1(a), in 50% of the patients, the ferritin level was higher than normal, whereas, 30% of the patients were having the normal values. Even 20% of the patients had the values lower than the normal values. But though the levels of procalcitonin and D-Dimer were reported to be elevated commonly, in case of the patients under this study the levels were elevated in case of only 73% and 72% patients respectively. While considering the CRP levels, 76% of the patients had elevated levels with 22% patients with normal levels. The creatinine level was elevated in case of 60% patients with remaining 40% having normal levels. But the alkaline phosphatase level was higher in 88% of the patients, while only 12% patients had the normal level of this enzyme.

In this study, it is obvious that there were elevated levels of various serological, hematological and immunological parameters observed in cases of COVID-19 patients in Dhaka City. But the elevation was not common in all the cases. The variation was prominent in case of ferritin levels, where 30% of the patients had the normal levels and even 20% of the patients had lower levels of ferritin. In case of all the parameters there were significant proportion of the patients having normal levels of these blood parameters and this information might have significant influence in managing the COVID-19 patients in future. However, further extensive studies are under processing and will be reported in time.

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Conflict of interest

Authors have no conflict of interest.

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