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Short communication

Laboratory findings of Libyan patients with COVID-19 in intensive care unit

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Abstract: The 2019 coronavirus disease (COVID-19) was declared by the World Health Organization as a pandemic on 11th March, 2020 which spread rapidly all over the world. COVID-19 disease has different clinical presentations, ranging from asymptomatic to severe symptoms. Laboratory findings are important in determining which therapeutic strategies to seek and to identify severe cases initially. In this study, we compared the results of C-reactive protein, D-dimer, blood electrolytes and mean corpuscular hemoglobin concentration between survivors and non-survivors of 22 Libyan patients with COVID-19 present in the intensive care unit at Maitika Isolation Center (Tripoli, Libya) in the period of January to June 2021. We could not detect any significant difference in C-reactive protein between survivors and non-survivors but a significant difference in D-dimer level was observed. Non-survivor COVID-19 patients have a higher level of D-dimer. Moreover, a statistical significant difference in chloride and sodium levels but not in potassium level were detected. A marked lower of mean corpuscular hemoglobin in non-survivor than survivor COVID-19 patients was shown. Thus, these parameters could act as biomarkers for COVID-19 patients.

Introduction

The COVID-19 pandemic (coronavirus pandemic), is global pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 patients can progressively develop serious complications, including sepsis, acute respiratory failure, metabolic acidosis, heart failure, kidney injury and eventually die [1]. C-reactive protein (CRP) is a plasma protein that is synthesized by the liver and induced by different inflammatory mediators such as IL-6 [2]. Despite being nonspecific, D-dimer is used clinically as a biomarker for different inflammatory complaints and an increase in its levels is associated with greater severity of the disease [3]. This protein can activate the complement through the classic route and has the ability to modulate the function of phagocytic cells, properties that suggest it would play a role in the efficacy of infectious agents and damaged cells [4]. The CRP marker was found to be significantly

increased in the initial phases of the infection for severe COVID-19 patients, also prior to indications of critical findings with CT [5]. Importantly, CRP has been associated with disease development and it is an early predictor for severe COVID-19. Normal range of CRP is up to 5.00 milligram per liter [6]. Coagulation biomarker (D-dimer) is a soluble fibrin degradation product that results from ordered breakdown of thrombi by the fibrinolytic system markedly elevated D-dimer is common in COVID-19 patients and is associated with poor prognosis. However, currently the interpretation of D-dimer during disease monitoring is unclear, as it may not be directly related to disease severity [7]. Many hematologic biomarkers have been used to stratify COVID-19 patients include white blood cells (WBC) count, lymphocyte count, neutrophil count, neutrophil-lymphocyte ratio (NLR), platelet count, eosinophil count and hemoglobin [8]. In addition, the hematological biomarker, mean corpuscular hemoglobin (MCH) which represents the average amount of hemoglobin in the red blood cell. Normal range of MCH is 28 to 30 picogram and normal range of D-dimer is up to 0.50 milligram per liter. The level of blood electrolytes including sodium, potassium and chloride is important in calculating the anion gap and correction of acid-base imbalance. Normal range of blood sodium is 135.0 to 150.0 milli-mole per liter, potassium is 3.50 to 5.50 milli-mole per liter and for chloride is 98.0 to 107.0 milli-mole per liter [9]. The purpose of this study is to investigate how age affects the mortality for COVID-19 patients and to find if there is a marked change in the results of some blood tests seen at the first visit and their association with mortality of COVID-19 patients in Libya.

Materials and methods

Twenty-two patients were tested for positive COVID-19 admitted to intensive care unit in Isolation Center of Mitiga Hospital from January to June 2021. Thirteen patients are male patients and eight patients are female patients. 14 of the 22 patients were discharged (survivors) and eight patients deceased (non survivors).

C-reactive protein test: This test is based on the principle of the latex agglutination. When latex particles coated with human anti-CRP are mixed with a patient's serum containing CRP, a visible agglutination reaction will take place within two minutes. This procedure is according to the instructions given in the product [10, 11].

D-dimer test: The Alere Triage® D-Dimer test device contains all the reagents necessary for the quantification of cross-linked fibrin degradation products containing D-dimer in EDTA anticoagulated whole blood or plasma specimens [11]. MCH results are taken from the complete blood count result of each patient using Mindray BC-3600 Auto Hematology Analyzer [12].

Statistical analysis: Data are transformed into a Microsoft Excel spreadsheet and analyzed using Statistical Package for Social Sciences (SPSS) Version 23. Mean and standard deviations were used for the comparison of continuous variables ensuring normal distribution. Independent sample *t*-test was applied to compare survivors' biochemical and hematological findings to non-survivors in patients with COVID-19. The level of significance difference was set at $p < 0.05$ [13].

Results

Figure 1 shows the mean age of the patients in years (n = 22) included in this study, the youngest patient was male of 38 years old and the oldest patient was female of 107 years old, however, both of them are discharged. There is no significant difference between both groups (survivors and non-survivors). The non-survivor's patients are older than survivor's patients by about 10.0%. **Figure 2** presents the average of serum concentration of CRP in mg/dl for both groups discharged (survivors) and died (non-survivors) patients. Thus, the mean of both groups are almost the same with no statistical significant difference found by Student *t*-test. The highest level

of serum concentration was more than 200 mg per liter for the discharged female. In **Figure 3**, the mean of plasma concentrations of D-dimer of both groups are shown. Thus, the levels of D-dimer for non-survivor patients are almost double of the survivors patients with the highest results except three male patients discharged but the other individually were at normal values (0.73, 0.32 and < 0.25 mg/l).

Figure 4 represents the mean (± SD) of serum sodium level in COVID-19 patients. Thus, a marked high level is seen in non-survivor's patients as compared with survivor's patients. **Figure 5** shows the average of potassium level, the results for non-survivors were much higher than the survivor's patients. This is the same for serum chloride concentrations as shown in **Figure 6**. Thus, significant high levels of serum chloride of non-survivor's patients have higher values than the survivor's patients. However, in **Figure 7**, the average of the mean concentration of MCH is higher in survivor's patients than in the non-survivors patients with COVID-19 which had a lower concentration.

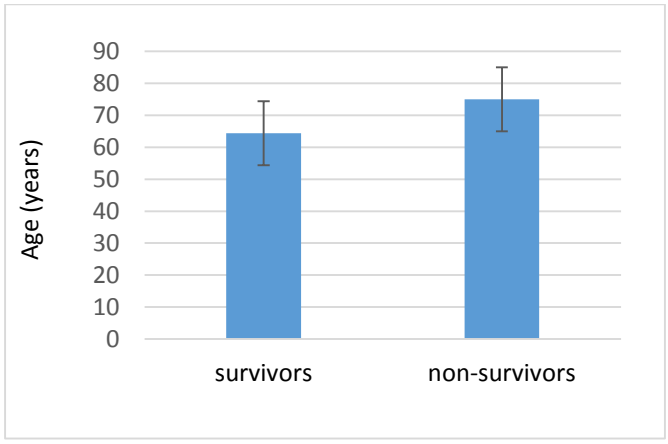

Figure 1: Age distribution of the COVID-19 Libyan patients

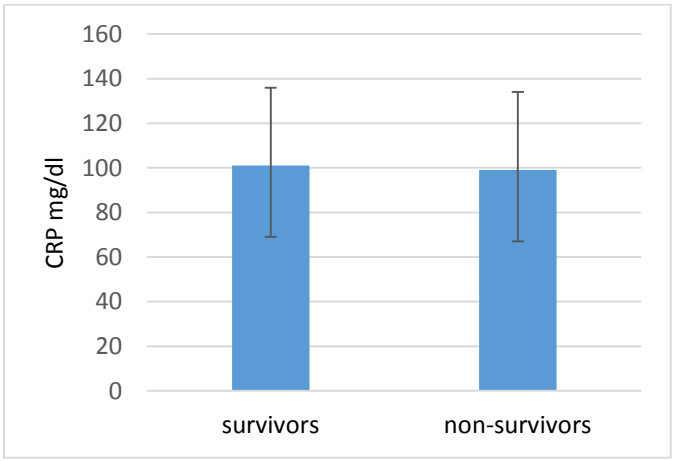

Figure 2: Mean corpuscular hemoglobin level in COVID-19 Libyan patients

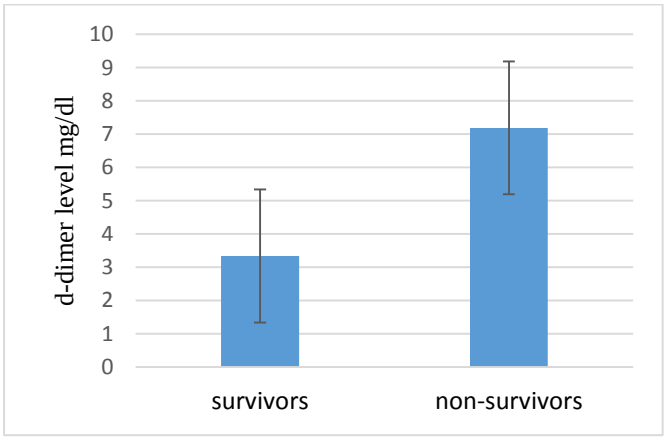

Figure 3: Plasma D-dimer concentration in COVID-19 Libyan patients

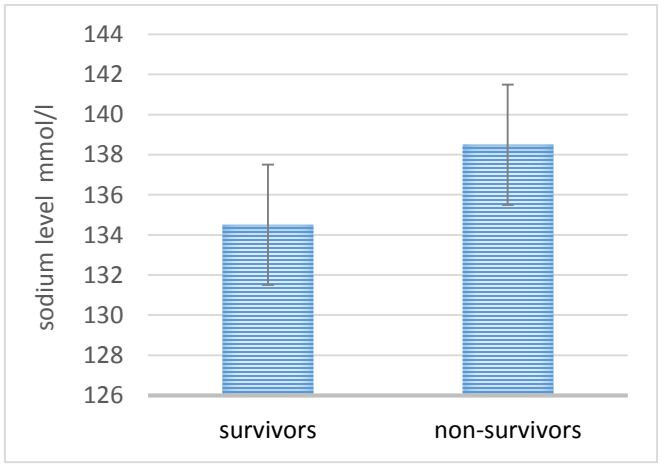

Figure 4: Serum sodium levels in COVID-19 Libyan patients

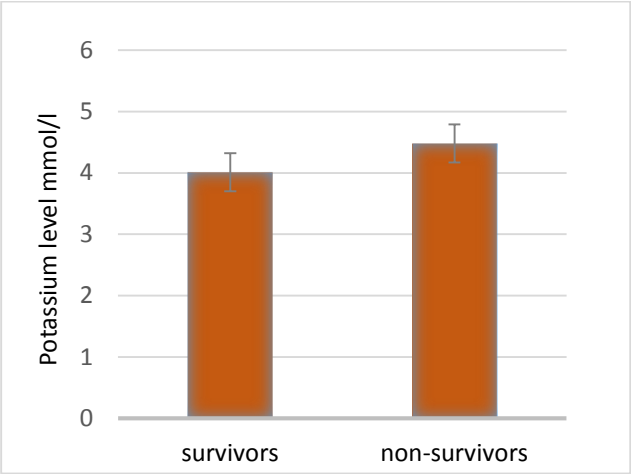

Figure 5: Serum potassium levels in COVID-19 Libyan patients

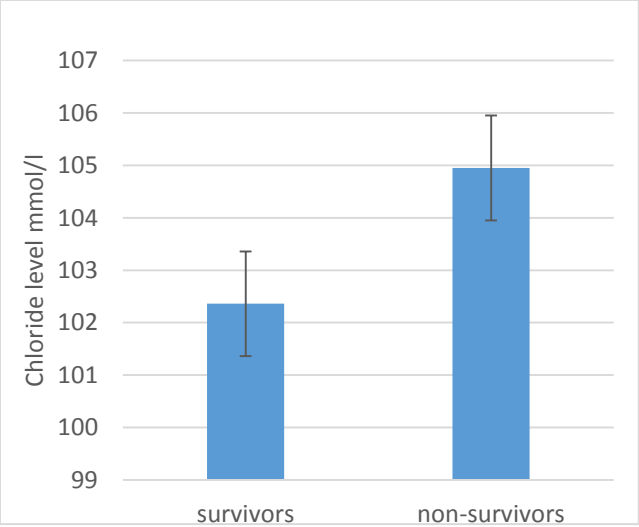

Figure 6: Serum chloride levels in in COVID-19 Libyan patients

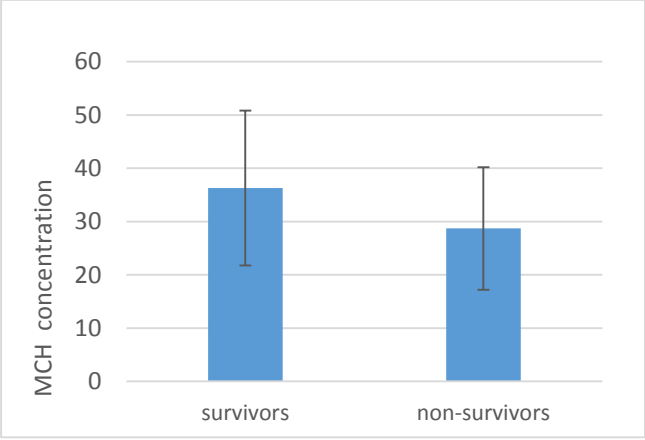

Figure 7: Mean corpuscular hemoglobin concentration in COVID-19 Libyan patients

Discussion

It has been shown that many biochemical parameters become altered in COVID-19 patients and these parameters have been associated with the severity of the disease and in some cases correlated with the prognosis of the patients [14 - 16]. Thus, this study analyzes the laboratory findings of COVID-19 survivors and non-survivors at the time of intensive care unit admission. It is found that the mean age of the patients who died with COVID-19 was higher than the survived patients. This finding is in a good agreement with the earlier findings on patients with COVID-19 [17]. Generally, older population have high rate of comorbidities, limited organ function, reduced lung capacity, impaired immune system, biological aging and more severe complications. These are the common reason hence clinicians should treat them with a more attention considering as a high-risk group [18].

It has been recorded that elevation of D-dimer as well as C-reactive protein and interleukin 6 (IL-6) is associated with unfavorable prognosis of the disease [19, 20]. In this study, we could not detect any significant difference in CRP between patients of survivors and non-survivors but it is noticed a high significant level of D-dimer in non-survivor COVID-19 patients. Also, some hematological differences have been correlated with the progression of COVID 19 such as lymphopenia, thrombocytopenia, neutrophilia and hypoalbuminemia [14, 15]. Thus, there is a marked lower MCH concentration in non-survivors than survivors. A previous study showed that electrolyte disturbances may affect the prognosis of COVID-19 patients [16]. Indeed, in this study, it is found that non-survivors have high level of the blood electrolytes as sodium, potassium and chloride. A statistically significant difference in chloride level has profoundly been detected. On the other hand, there is a drawback for the present study of using a small number of the participants that could limit the findings and to support this, a large sample is recommended.

Conclusion: This study guides clinicians to facilitate appropriate supportive management compared between survivors and non-survivors' cases of patients with COVID-19 disease in some biochemical characteristics.

Author contributions: RRW conceived, designed the study, and performed the analysis and interpretation of data. RAE collected and analyzed the data. TYE drafted the manuscript. All authors approved the final version of the manuscript and agreed to be accountable for its contents.
Conflict of interest: The authors declare absence of any commercial or financial relationships that could be construed as a potential conflict of interest.
Ethical issues: Including plagiarism, informed consent, data fabrication or falsification and double publication or submission have completely been observed by authors.
Data availability statement: The raw data that support the findings of this article are available from the corresponding author upon reasonable request.
Author declarations: The authors confirm that all relevant ethical guidelines have been followed and any necessary IRB and/or ethics committee approvals have been obtained.

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