

Correlation of different inflammatory and biochemical parameters in Covid-19 patients- A retrospective study

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Abstract: *Background:* The Covid-19 pandemic is not just a challenge for health care systems; it is also a huge economic burden. One way to minimize this burden is by allocating the resources in proper direction for the management of the disease. *Aims and Objectives:* To correlate among the following inflammatory and biochemical markers, CRP, LDH, Troponin-I, Ferritin and D-dimer. *Materials and Methods:* The study population includes all the laboratory data of Covid 19 patients of KIMS hospital from May 2020 to October 2020. The parameters included in the study are C-Reactive protein (CRP), Ferritin, Lactate Dehydrogenase (LDH), Troponin I, D-dimer. CRP and LDH were estimated by micro-slide method, Ferritin and Troponin I were estimated by Chemiluminescence immunoassay and D-dimer was estimated by turbidimetric immunoassay. *Results:* The parameters CRP, Ferritin, LDH and D-dimer were positively correlated with each other, but none of them showed statistically significant correlation. Troponin-I did not show any correlation with the other parameters. *Conclusion:* We conclude that no isolated parameter individually is beneficial in covid-19 management and choice of parameter need to be based on merit of case or associated complications.

Keywords: Correlation, Covid-19, Laboratory parameters.

Introduction

The repercussions from COVID-19 has impacted virtually every aspect of the economies of most nations all through the world, one of the major affected being the health care sector, which has been met with many difficulties in attempting to adapt to and react to the pandemic [1]. Various laboratory parameters were identified to play a role in investigating a case of Covid-19. Some of them were Ferritin, Troponin-I, Lactate dehydrogenase (LDH), C-reactive protein (CRP), D-dimer, γ -Interferon and Interleukin-6, Neutrophil-Lymphocyte ratio etc. Ferritin isn't simply connected with the inflammatory process, but it could be an indicator of cell injury, especially when serum ferritin levels are above 600 ng/mL, infers a direct relationship between organ damage and ferritin formation [2].

CRP is a protein produced by the liver, and is an important and early indicator of inflammation and infection [3]. The half life of CRP is about 19hours [4] and the CRP concentration decreases

when the healing process starts or when the inflammatory process ends [5]. LDH release in the circulation can be seen when there is cytokine mediated tissue injury or damage in case of severe infections [6]. D-dimer is a degradation product of fibrin, it is used widely as a marker for thrombotic diseases. In severe Covid-19 disease it is found that there is activation of coagulation cascade, which may be as a result of viremia or cytokine storm. This may result in thrombotic complications and coagulopathies in Covid-19 patients [7].

One of the complications seen with SARS Cov-2 pneumonia, is direct injury to the myocardial cells causing myocarditis, which may lead to impairment in cardiac contractility, it is also seen that there is formation of pericardial effusion as a result of pericarditis. Troponin-I which is a major cardiac marker, thus tends to elevate in such cases of Covid-19 [8]. The Covid 19 pandemic is not just a challenge for health care systems; it is also a huge economic

burden. One way to minimize this burden is by allocating the resources in proper direction for the management of the diseases. A proper protocol for laboratory investigations to be performed in Covid 19 patient is not available. Hence this leads to huge investment of resources in the investigation done for these patients. Hence, we intended to study the correlation between different inflammatory and biochemical parameters in Covid 19. If a strong association is found between the parameters, the number of investigations to be performed can be minimized.

This helps in allocating the resources for management of these patients in optimal way. As our sample size is large, the results obtained from this study can be extended to the population at large and will definitely help in improving the existing knowledge about the laboratory markers in Covid 19 disease.

Aims and Objectives: To correlate among the following inflammatory and biochemical markers, CRP, LDH, Troponin I, Ferritin and D-dimer.

Material and Methods

The study population includes the laboratory data of Covid 19 patients of KIMS hospital from May

2020 to October 2020. Coronavirus-positive babies, mothers, pregnant women, and patients whose total information was not accessible were excluded from the study.

The parameters included in the study are Ferritin, Troponin I, D-dimer, CRP and LDH. CRP and LDH were estimated by micro-slide method, Ferritin and Troponin I were estimated by Chemiluminescence immunoassay and D-dimer was estimated by turbidimetric immunoassay.

Ethical committee permission was obtained from the institutional ethical committee (No.KIMS/EC/415/2020-21). Statistical analysis was done using SPSS (IBM SPSS ver.21) and Medical software.

Results

Descriptives of various Biochemical parameters are shown in table 1. The parameters CRP, Ferritin, LDH and D-dimer were positively correlated with each other (Table 2), but none of them showed statistically significant correlation. Troponin-I did not show any correlation with the other parameters (Table 2).

Table-1: Descriptives of various Biochemical parameters

| Sl. No | No of patients | Minimum | Maximum | Mean | Standard. Deviation | Standard Error |
|--------|----------------|---------|---------|----------|---------------------|----------------|
| 1 | 1719 | 1.0 | 725.0 | 43.24 | 42.69 | 1.029 |
| 2 | 1719 | 1.0 | 1001.0 | 383.841 | 218.96 | 5.2811 |
| 3 | 1719 | 0.01 | 535.00 | 0.7364 | 17.478 | 0.4215 |
| 4 | 1719 | 1.0 | 6387.0 | 369.65 | 344.26 | 8.3034 |
| 5 | 1719 | 4.0 | 90500.0 | 1807.042 | 4680.12 | 112.88 |

Table-2: Table showing correlation coefficient of all parameters

| Sl.No | Parameters | | CRP | LDH | Troponin I | Ferritin | D-Dimer |
|-------|------------|---------------------|---------|---------|------------|----------|---------|
| 1 | CRP | Pearson correlation | 1 | 0.351** | - 0.013 | 0.304** | 0.156** |
| | | Sig.(1-tailed) | | 0.000 | 0.292 | 0.000 | 0.000 |
| 2 | LDH | Pearson correlation | 0.351** | 1 | -0.004 | 0.429** | 0.319** |
| | | Sig.(1-tailed) | 0.000 | | 0.432 | 0.000 | 0.000 |
| 3 | TROPONIN-I | Pearson correlation | -0.013 | -0.004 | 1 | -0.020 | -0.010 |
| | | Sig. (1-tailed) | 0.292 | 0.432 | | 0.202 | 0.346 |
| 4 | FERRITIN | Pearson correlation | 0.304** | 0.429** | -0.020 | 1 | 0.153** |
| | | Sig. (1-tailed) | 0.000 | 0.000 | 0.202 | | 0.000 |
| 5 | D DIMER | Pearson correlation | 0.156** | 0.319** | -0.010 | 0.153** | 1 |
| | | Sig. (1-tailed) | 0.000 | 0.000 | 0.346 | 0.000 | |

Discussion

The global pandemic caused by novel corona virus disease (COVID-19) still remains poorly understood. Identifying biological markers associated with prognosis can help clinicians to diagnose and manage disease.

In the present study we found that the parameters CRP, Ferritin, LDH and D-dimer were positively correlated with each other (Table 2), but none of them showed statistically significant correlation. Troponin-I did not show any correlation with the other parameters (Table 2). Study conducted by Yumeng Yao et al on 248 cases shows that D-dimer level of > 2.14 mg/L predicted in-hospital mortality with a sensitivity of 88.2% and specificity of 71.3% (AUC 0.85; 95% CI = 0.77–0.92) [9].

Study conducted by B. Cheng et al on 456 cases showed higher levels of NLR and CRP at admission were associated with poor prognosis of individuals with moderate COVID-19. NLR and CRP were good predictors of progression to critical condition and death [10]. Study conducted by Jonathan Feld et al on 942 patients showed that though many patients with COVID-19 present with hyper-ferritinemia, elevated ferritin levels are not accurate predictors of outcomes and do not appear to be indicative of hemophagocytic

lymphohistiocytosis [11]. Study conducted by Jie Yang, MD et al on 357 patients showed that high-sensitivity troponin T could not be considered as a predictor for prognosis [12]. Study conducted by Chang Li on 203 patients found that serum LDH levels had 58.7% sensitivity and 82.0% specificity, based on a best cutoff of 277.00 U/L, for predicting severe COVID-19. And a cut-off of 359.50 U/L of the serum LDH levels resulted in a 93.8% sensitivity, 88.2% specificity for predicting death of COVID-19 patients [13].

We could not find any studies similar to our study, where the individual parameters were correlated with each other. Hence, we could not show any reference similar to our study.

Conclusion

We conclude that no isolated parameter individually is beneficial in covid-19 management and choice of parameter need to be based on merit of case or associated complications.

Limitations: As this study is a retrospective study and was done on a large sample size, we were not able to collect the clinical severity of the patients.

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References

1. Kaye AD, Okeagu CN, Pham AD, Silva RA, Hurley JJ, Arron BL et al. Economic impact of COVID-19 pandemic on healthcare facilities and systems: International perspectives. *Best Pract Res Clin Anaesthesiol*, 2021; 35(3):293-306.
2. Banchini F, Cattaneo GM, Capelli P. Serum ferritin levels in inflammation: a retrospective comparative analysis between COVID-19 and emergency surgical non-COVID-19 patients. *World J Emerg Surg*, 2021; 16(1):9.
3. Sproston NR, Ashworth JJ. Role of C-reactive protein at sites of inflammation and infection. *Front Immunol*, 2018; 9(APR):1-11.
4. Pepys MB, Hirschfield GM. C-reactive protein: a critical update. *J Clin Invest*. 2003; 112(2):299-299.
5. Henry BM, Aggarwal G, Wong J, Benoit S, Vikse J, Plebani M et al. Lactate dehydrogenase levels predict coronavirus disease 2019 (COVID-19) severity and mortality: A pooled analysis. *Am J Emerg Med [Internet]*. 2020; 38(9):1722-1726.
6. Martinez-Outschoorn UE, Prisco M, Ertel A, Tsigos A, Lin Z, Pavlides S, et al. Ketones and lactate increase cancer cell "stemness", driving recurrence, metastasis and poor clinical outcome in breast cancer: Achieving personalized medicine via metabolo-genomics. *Cell Cycle*, 2011; 10(8):1271-1286.
7. Wool GD, Miller JL. The Impact of COVID-19 Disease on Platelets and Coagulation. *Pathobiology*, 2021; 88(1):15-27.
8. Piccioni A, Brigida M, Loria V, Zanza C, Longhitano Y, Zaccaria R et al. Role of troponin in COVID-19 pandemic: A review of literature. *Eur Rev Med Pharmacol Sci*. 2020; 24(19):10293-10300.
9. Yao Y, Cao J, Wang Q, Shi Q, Liu K, Luo Z, et al. D-dimer as a biomarker for disease severity and mortality in COVID-19 patients: A case control study. *J Intensive Care*, 2020; 8(1):1-11.

10. Cheng B, Hu J, Zuo X, Chen J, Li X, Chen Y, et al. Predictors of progression from moderate to severe coronavirus disease 2019: a retrospective cohort. *Clinical Microbiology and Infection*, 2020; 26:1400-1405.
11. Feld J, Tremblay D, Thibaud S, Kessler A, Naymagon L. Ferritin levels in patients with COVID-19: A poor predictor of mortality and hemophagocytic lymphohistiocytosis. *Int J Lab Hematol*, 2020; 42(6):773-779.
12. Yang J, Liao X, Yin W, Wang B, Yue J, Bai L, et al. Elevated cardiac biomarkers may be effective prognostic predictors for patients with COVID-19: A multicenter, observational study. *Am J Emerg Med [Internet]*, 2021; 39(37):34-41.
13. Li C, Ye J, Chen Q, Hu W, Wang L, Fan Y et al. Elevated Lactate Dehydrogenase (LDH) level as an

independent risk factor for the severity and mortality of COVID-19. *Aging (Albany NY)*, 2020; 12(15):15670-15681.

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