

Estimation of CRP and some hematological parameters with COVID -19 patients using ANOVA as a statistical tool

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Abstract:

Coronaviruses (CoVs) are a group of related viruses that can cause respiratory tract infection in humans ranging from mild symptoms to lethal outcomes. Serum CRP is the major indicators of inflammatory severity in intensive care medicine, had significantly increased or stayed at a relatively high level in death event group, and is closely related to poor recovery of COVID-19 patients. (CRP), point to development of a systemic inflammatory response syndrome (SIRS) picture in patients with a severe form of the disease. Hematologic biomarkers used to stratify COVID-19 patients include WBC (leukocyte) count, lymphocyte count. WBCs may signify clinical worsening and increased risk of a poor outcome. With the SARS virus, it was suspected that lymphocytes are essential to eliminating virally infected cells.

This study was conducted on (267) patients who diagnosed with, SARS -COV2, patients were divided into three age group the first group number (68) patient's _young age_ (18-39) years and the second number (109) patient's _middle age_ (40-62) year's, The third group number (98) patient's _elderly_ (63-85) years. The Fresh blood (3 ml) sample collected from each patient for whole blood and serum, The serum CRP model was determined by using Roche Cobas Integra 400 plus (Roche diagnostics GmbH, Mannheim, Germany) that the principle of device action by four measuring technologies: Absorbance photometry, Turbidity, Fluorescence polarimetry, Ion – Selective electrode, Whole blood CBC assay done by full automated counter by Sysmex device.

Keywords: Covid-19, CRP, SARS -COV2, SIRS, Lymphopenia.

Introduction

A series of pneumonia cases of unknown cause appeared in Wuhan, China in December, 2019, the pathogen that caused the pneumonia, which was named 2019-nCoV, a novel type of beta-coronavirus (Zhu *et al.*, 2020, E Gupta *et al.*, 2020a; E Gupta *et al.*, 2020b;).

In the fight against coronavirus disease 2019 (COVID- 19), now a worldwide pandemic, urgent identification of clinical and laboratory predictors of progression towards severe and fatal forms is urgently needed (WHO, 2020), The identification of laboratory parameters capable of discriminating between severe and non-severe cases, or those at high or low risk of mortality, will allow for improved clinical situational awareness (Lippi *et al.*, 2020).

The application of CRP predictor in COVID-19 has been highlighted by a retrospective single-centre study in Wuhan, China, where the majority of patients in the severe cohort showed significantly higher levels compared to the non-severe cohort (Qin *et al.*, 2020).

WBC is a reflection of excessive inflammation, leukocytosis indicated that severe illness or ICU admission for SARS-CoV-2 pneumonia (Jasim *et al.*, 2021; Jia *et al.*, 2021).

Lymphocyte count - as a biomarker of an exhausted adaptive immune system – is associated with COVID-19 severity. Patients who died from COVID-19 are reported to have had significantly lower lymphocyte counts than survivors (Henry, 2020a; Jasim *et al.*,2021).

Materials and Method

This study was conducted on (267) patients who diagnosed with, SARS -COV2, The diagnostic criteria for COVID-19 followed the interim which mainly included clinical symptoms by physician, thoracic CT examination, and results of SARS-CoV-2 nucleic acid detection.

The Fresh blood (3 ml) sample collected from each patient that diagnosed positive with SARA-COV2 , taken from each patient and direct divided into (2ml) of blood put into EDTA tube to obtain whole blood for CBC test and (1ml) put into gel tube for serum CRP.

The serum CRP model was determined by using Roche Cobas Integra 400 plus (Roche diagnostics GmbH, Mannheim, Germany) that the principle of device action by four measuring technologies: Absorbance photometry, Turbidity, Fluorescence polarimetry, Ion – Selective electrode (Roche company, Germany), Whole blood CBC assay done by Operation full automated device five part (Leukocyte differentiation) Sysmex hematology analyzer , Configuration :compact, technology flow cytometry, fluorescence flow cytometry.

Statistical analysis

The results were statically analyzed by using GraphPad Prism software, version 8.34 (GraphPad Software, La Jolla, Calif) and ANOVA one way were used to assess the degree of various group.

Results and Discussion

In the fight against coronavirus disease 2019 (COVID- 19), now a worldwide pandemic, urgent identification of clinical and laboratory predictors of progression towards severe and fatal forms is urgently needed. These predictors will enable risk stratification, guide interventional studies to target patients at enhanced risk of developing severe disease and optimize allocation of limited human and technical resources in the ongoing pandemic(Henry *etal.*,2020c).

In this study focusing on three parameters thus are used for monitoring prognosis in COVID-19 patients. These elevations, along with elevated C-reactive protein (CRP), point to development of a systemic inflammatory response syndrome (SIRS) picture in patients with a severe and non-sever form of the disease, and the increased WBC, and decreased lymphocyte patients with a severe and non-sever.

In this study the patients were divided into three age group the first group number (68) patient's _young age _ (18-39) years and the second number (109) patient's _middle age_ (40-62) years, the third group number (98) patient's _elderly_ (63-85) years.

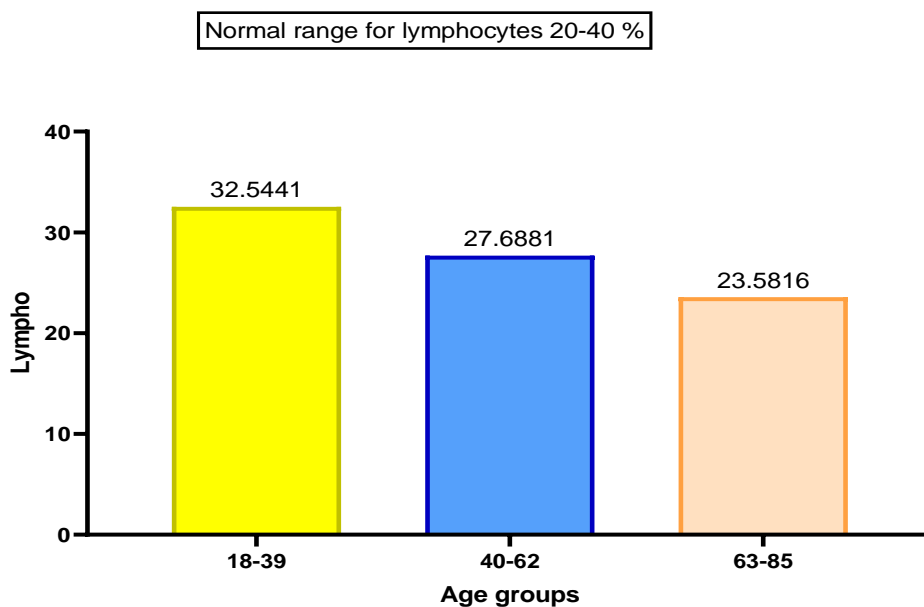
The current study finding, increased levels of C-creative protein, were related to severe illness or ICU admission with COVID-19 and this rising of CRP level clearly appears in third group elderly group that suffering from pneumonia and immune complications with mean (39 mg/L), than less severe cases or non-severe (non-ICU) disease by first group with mean (15.8 mg/L) and second group with mean (23.8 mg/L) as shown in Figure-1.

That we noted the younger and middle age group patients most of them non-sever or moderate severity infection and the immune system defenses working Correctly; the WBC with in normal increase and lymphocyte with decreased the severity rising with getting old so the WBC in high level with mean (12.7) in elderly group that patients within immune complications and severe and critical cases in hospitalization ICU with oxygen saturation and suffering from pneumonia the lymphocyte decreased shown in Figure-2 and Figure-3.

There are several studies reported similar results to the current study such as ; leukocytosis is a reflection of excessive inflammation, which is also reflected in the much higher C-reactive protein levels among patients with severe (ICU) COVID-19.Lymphopenia was more common in severe (ICU) than in non-severe (non-ICU) patients, probably owing to translocation of lymphocytes from peripheral blood to the lungs (Xu *etal.*,2020).

Lymphopenia, excessive activation of the inflammatory cascade, crucial features of COVID-19 disease and have high prognostic value. The understanding of the underlying mechanisms is still limited. Based on the observations derived from clinical practice, it has also been postulated that coronaviruses may directly infect bone marrow precursors, resulting in abnormal hematopoiesis, or trigger an auto-immune response against blood cells (Akhmerov and Marban, 2020).

Figure-1: Shown the mean of CRP level for each group.



Conclusions

The study concluded in a meta-analysis on 21 studies including 3377 COVID-19 positive patients that patients with severe and fatal disease had significantly increased WBC, and decreased lymphocyte and platelet counts compared to non-severe disease and survivors (Henry *et al.*,2020b).

The study reported lymphopenia in 80% of critically ill adult COVID-19 patients, whereas reported a rate of only 25% of patients with mild COVID-19 infection (Yang *et al.*, 2020). These observations suggest that lymphopenia may correlate with infection severity (Chen *et al.*, 2020; Jasim *et al.*,2021).

Several clinical studies have shown that lymphopenia occurs frequently in COVID-19 patients, manifested as the decrease of total T cells, CD4+T cells and CD8+T cells in the peripheral blood; with the degree of decline related to the severity of the disease, Compared with patients with mild symptoms, a higher proportion of severe or deceased patients had lymphopenia (Chen *et al.*, 2020) which is similar to the observation during SARS-CoV infection (Yaqian *et al.*, 2020)

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