



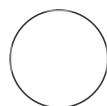
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# Correlation of serum interleukin-6 levels and neutrophil-lymphocyte ratio in the severity of COVID-19

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## ABSTRACT

## OPEN ACCESS

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We use this protocol and it's working

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**Background:** Interleukin-6 (IL-6) is a pro-inflammatory cytokine that is produced at varying levels in patients with coronavirus disease 2019 (COVID-19). The neutrophil-lymphocyte ratio (NLR) is one of the new inflammatory markers of COVID-19. This study aimed to evaluate the differences in IL-6 level and the NLR in mild and severe COVID-19 and assess their correlation with COVID-19 severity and the correlation of IL-6 and NLR in COVID-19.

**Methods:** A total of 91 patients with COVID-19 were divided into mild (n = 57) and severe (n = 34) COVID-19 groups. IL-6 levels were measured using the electrochemiluminescence immunoassay method on Roche Cobas e411. The NLR was the ratio of the total neutrophil and lymphocyte counts from complete haematology on the Sysmex XS-800i. Data were analysed using the Kolmogorov-Smirnov, Mann-Whitney, receiver operating characteristic curve, chi-square and Spearman correlation tests. The statistical test was significant at  $p < 0.05$ .

**Results:** Serum IL-6 levels and NLR significantly differed in mild and severe COVID-19. The median (min-max) IL-6 levels for mild and severe COVID-19 were 3.59 (1.50-638.30) pg/mL and 28.82 (5.52-926.30) pg/mL, respectively ( $p < 0.001$ ). The median (min-max) NLR in mild and moderate COVID-19 was 2.18 (0.69-15.58) and 8.13 (2.24-30.90), respectively ( $p < 0.001$ ). The obtained cut-off values for IL-6 and NLR were  $>6.99$  pg/mL and  $>4.18$ , with odds ratios of 29.29 and 26.19, respectively. A positive correlation was found between IL-6 and NLR and COVID-19 severity ( $r = 0.612$ ;  $p < 0.001$ ).

**Conclusions:** The results indicated that serum IL-6 levels and NLR are higher in severe COVID-19 than in mild COVID-19. Patients with IL-6 levels  $>6.99$  pg/mL and NLR  $>4.18$  are 29 and 26 times more likely to suffer from severe COVID-19, respectively. Serum IL-6 levels and NLR are strongly correlated with COVID-19 severity. Serum IL-6 levels correlate with NLR in COVID-19.

The Research Protocol : Correlatioan of interleukin-6 Levels..

- 1 The research protocol consisted of subject allocation, research flow, laboratory examination, method analysis
- Subject Allocation
- Research subjects who met the inclusion criteria were divided into two groups, namely the mild and severe COVID-19 group
- Research Procedures
- Record the identity of patients/controls who meet the inclusion criteria and provide a complete explanation of what will be done to them, and if they agree, they will fill out and sign an informed consent.
  - Subjects who met the inclusion criteria were taken 3 ml of venous blood samples each in EDTA tubes and plain. The blood in the EDTA tube is checked for complete hematology. Serum was obtained after a tube containing blood formed a clot for 30 minutes at room temperature and was centrifuged for 20 minutes at 3000 rpm. Serum samples were collected until sufficient, and stored at -20°C, while samples were thawed at 25°C before analysis.
- Laboratory examination
- Interleukin-6 Elecsys System test
- Instrument : cobas e 411
- Sample: Serum
  - Tools and Materials
    - Instrument cobas e 411
    - IL-6 reagent
    - IL-6 calibrators and controls
    - Diluents
- Test principle: Sandwich with ECLIA method (electrochemiluminescence)
- Test work, carried out in advance with a series of preparations, including daily calibration and quality control. Sample work is carried out according to the procedures determined by the factory.
- Measuring Range: 1.5 – 5000 pg/mL (or 50000 pg/mL if diluted up to 10 times) Reference Value: Up to 7 pg/mL
- Analysis Method
- The data obtained are grouped according to the purpose and data type, then the appropriate statistical method is selected.
- The primary data characteristics are displayed descriptively. The normality test of the data is the Kolmogorov-Smirnov test. Differences in IL-6 levels and NLR values between the two mild and severe COVID-19 groups using Mann Whitney, the IL-6 and NLR cutoffs were determined from the ROC curve, and the correlation of IL-6 and NLR levels with the severity of COVID-19 with the Chi-Square test, Correlation of IL-6 and NLR in COVID-19 with Spearman. The statistical test was stated to be significant if the p-value <0.05

