# Clinical Overview, Laboratory Findings, And Radiological Outcomes Of COVID-19 Patientsin The City Of Bandung

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**ABSTRACT**

This study analyzed the chest CT of COVID-19 patients with clinical and laboratory features. A retrospective study of chest CT, laboratory analysis, and clinical features of patients with COVID-19 was conducted from March to September 2020. Sixty-nine symptomatic patients agreed to join the study. The scoring for chestCT was based on the proportion of lobar involvement with visual assessment. Chest CT scores were paired with clinical and laboratory findings. The relation of all these findings with the patients' outcomes was statistically assessed with univariate and multivariate analyses. Ground glass opacity was the most common finding in the early course of the disease (≤ 7 days), while crazy-paving, consolidation, and fibrosis were dominantly observed in the latephase (>7 days). The CT score was significantly higher in severe patients (p < 0.0001) and late-phase than that in early-phase patients (p < 0.0001). CT score was significantly correlated with CRP (p<0.001), ALC (p=0.002) and NLR (p<0.001).Chest CT score correlates significantly with laboratory findings and disease severity in COVID-19 patients. Therefore, chest CT score has a potential role in estimating the outcomes of these patients. In addition, a Faster diagnostic workup in symptomatic cases would be beneficial to the patients.

**Keywords:** Chest CT, Pneumonia, COVID-19, Laboratory findings.

## INTRODUCTION

### Corona Virus in General

The Coronavirus disease (COVID-19) spread throughout China, and other countries have caused a global pandemic(Kannan et al., 2020). With a very high transmission rate, the spread of the coronavirus took place very quickly in various regions in Indonesia. Just a few days since the first cases were identified in Indonesia, it has increased to more than 200% of patients and continues to improve every day(Shuja, 2020). As of May 20, 2020, Indonesia recorded 19,189 confirmed cases with 1,242 deaths, and 12.9% of the confirmed cases were identified in West Java.

Some mortality risk factors of COVID-19 patients reported are older age, lymphocyte count, C. Reactive Protein (CRP), and neutrophil-to-lymphocyte ratio (NLR)(Dzefi-Tettey et al., 2020).

These risk factors are well known as non-dynamic information(Mado et al., 2021).Meanwhile, patients with COVID-19 might reflect the disease severity(Teichgräber et al., 2021; Tirivangani et al., 2021). However, the relation of dynamic profiles of radiography with clinical findings of Covid-19 remains unclear(Kumar, 2020).

The influence of the CT Test clinical trial and the laboratory results is evidence that affects the death of patients due to the Covid-19 virus(Abosamak et al., 2021; Lindgren et al., 2021). So, it is necessary to research the relationship between these two factors. This study aimed to analyze the relationship between chest CT findings of Covid-19 patients with clinical and laboratory features. The study results are expected to be an illustration for related parties in handling Covid-19 cases wisely.

**RESEARCH METHODE**

Behavioral research methods are used to observe the behavior of respondents. This study was conducted at the Department of Radiology St. Hospital. Borromeus Bandung from March to September 2020. We included patients with Covid-19 aged 18-30 years old who had undergone a plain thorax CT scan and haematological examination (ALC, NLR, and CRP). This study involved 69 patients who were willing to become respondents. All respondents with suspected Covid-19 were diagnosed according to the WHO interim guidelines. Respondents were selected based on positive SARS-CoV-2 RT-PCR test results and clinical symptoms in the standard screening regulations for COVID-19 infection(Abosamak et al., 2021). All respondents have signed General Consent and Informed Consent, Ethics Committee, and Hospital Legal approval. Chest CT findings, as well as clinical data, were collected and analyzed. Univariate and multivariate analyses statistically assessed the association of all these findings with patient outcomes(Kongstad et al., 2017).

**RESULTS**

**Characteristics of respondents**

The characteristics of respondents in the study can be seen in table 1.

Table 1. Baseline Characteristics of Study Subjects

| No | Variables | N=69 (Percentage) |
|---|---|---|
| 1 | Age (in a year), average (standard deviation) | 50.6 (13.6) |
| 2 | Gender, n (%) | |
| | Male | 43 (62) |
| | Female | 26 (38) |
| 3 | Comorbidity n (%) | |
| | Yes | 23 (33) |

| | No | 46 (67) |
|---|---|---|

**Characteristics of a chest CT scan of a confirmed Covid-19 patient in St. Borromeus Hospital, Bandung**

The results of recording in table 2the characteristics of chest CT scans of confirmed Covid-19 patients.

Table 2. Characteristics of Respondent's chest CT scan

| No | Features Of the Chest CT scan | Amount | Percentage |
|---|---|---|---|
| 1 | **Lesion Opacity** | | |
| | GGO | 10 | 14.49 |
| | Crazy Paving Pattern | 32 | 46.38 |
| | Consolidation | 24 | 34.78 |
| | Normal | 3 | 4.35 |
| | Total | 69 | 100.00 |
| 2 | **Distribution** | | |
| | Central | 0 | 0.00 |
| | Peripheral | 66 | 95.65 |
| | Normal | 3 | 4.35 |
| | Total | 69 | 100.00 |
| 3 | **Lesion Distribution** | | |
| | Anterior | 2 | 2.90 |
| | Posterior | 64 | 92.75 |
| | Normal | 3 | 4.35 |
| | Total | 69 | 100.00 |
| 4 | **Distribution of Chest CT Scan Images based on The Course of Time** | | |
| | Early | 10 | 14.49 |
| | Progressive | 32 | 46.38 |
| | Peak | 24 | 34.78 |
| | Absorption | 0 | 0.00 |
| | Normal | 3 | 4.35 |
| | Total | 69 | 100.00 |

**Correlation Between CT scan Severity Score and Haematology Examination (ALC, NLR and CRP)**

The correlation between CT scan severity scores and haematological examinations can be seen in table 3.

Table 3. Correlation Between CT Scan Severity Score and Hematologic Examination

| No | Haematology Examination | CT scan severity score | | | |
|---|---|---|---|---|---|
| | | Yes | No | Total | P |
| 1 | **ALC Criteria** | | | | |
| | Light | 7 | 9 | 16 | 0.002# |
| | Medium | 29 | 10 | 39 | |
| | Heavy | 14 | 0 | 14 | |
| | Total | 50 | 19 | 69 | |
| 2 | **NLR Criteria** | | | | |
| | Light | 7 | 9 | 16 | 0.002# |
| | Medium | 29 | 10 | 39 | |
| | Heavy | 14 | 0 | 14 | |
| | Total | 50 | 19 | 69 | |
| 3 | **CRP Criteria** | | | | |
| | Light | 5 | 11 | 16 | <0.001# |
| | Medium | 38 | 1 | 39 | |
| | Heavy | 14 | 0 | 14 | |
| | Total | 57 | 12 | 69 | |

[*1, 3] Fisher's exact test for count data

[*2] Chi-square Examination

Table 3 shows severity scores based on CT scan and clinical ALC in COVID-19 patients (p = 0.002).Severity scores based on CT scans and clinical for NLR in COVID-19 patients (p = 0.002). There was a statistically significant relationship between severity scores based on CT scans and clinical criteria for NLR in COVID-19 patients (p<0.001)(X. Wang et al., 2020).Finally, there was a statistically significant correlation between severity scores based on CT scans and clinical criteria for CRP in COVID-19 patients (p<0.001)(Desideri et al., 2021).

**Conformity Value**

The Fleiss-Cohen version of the kappa index was analyzed for CT severity scores and clinical findings in determining disease severity. Fleiss-Cohen results can be seen in table 4.

Table 4.  Conformity Table Thoracic CT Scan Severity Scores of Study Subjects with Severity Scores based on Clinical Findings

| CT scan severity score | Severity Score based on Clinical Findings | | | |
|---|---|---|---|---|
| | Mild | Moderate | Severe | Total |
| Mild | 16 | 0 | 0 | 16 |
| Moderate | 3 | 27 | 9 | 49 |
| Severe | 0 | 4 | 10 | 14 |
| Total | 19 | 31 | 19 | 69 |

Table 4 shows a statistically significant agreement between the two findings. The weighted kappa index was 0.76 (lower and upper bounds of the 95% confidence intervals of 0.65 and 0.88), Z = 13.46, p < 0.0001. Therefore, the power of understanding is classified as very good.

**DISCUSSION**

Assessment of disease severity was carried out by compatibility test between chest CT scan and haematological examination (ALC, NLR, and CRP). Sixty-nine Covid-19 subjects from 100 patients with Covid-19 symptoms were recorded in the St. Hospital Information System(Besutti et al., 2021). Borromeus met the inclusion criteria(C. Li et al., 2020).

Demographic characteristics including age and gender are risk factors for Covid -19 death, as evidenced by a p-value <0.05. The age factor is important for the disease outcome of patients exposed to the Covid-19 virus(Kostakoglu et al., 2021; Mendes & Pereira, 2021). The mean age of the patients who died was 68 years and significantly older than those who recovered(Chen et al., 2021). Old age is a high-risk factor for COVID-19 death(Hajek et al., 2021; Mohamed et al., 2020). The percentage of Covid -19 deaths increases with age, with the youngest patients 5% to the oldest 55% (Han et al., 2020).Gender is one of the factors that can be used as an indicator of the death rate, where men have a higher mortality rate than women(Gianotti et al., 2020). Men have higher chronic comorbidities, such as cardiovascular disease, hypertension, lung disease, and smoking(Z. Li et al., 2020; Wickens et al., 2021).

The distinctive features of the CT scan image of the thorax of Covid -19 patients are the GGO image (14.49%), Crazy Paving Pattern (46.37%), and consolidation (34.78%). In addition, the distribution of lesions was found in 92.75% of patients with dominant lesions on the posterior aspect and 95.65% on the peripheral part(Desideri et al., 2021).

NLR is associated with many other infectious diseases(Niu et al., 2021). Neutrophils (NEU) are a massive part of the active leukocyte population and migrate from the venous system to organs or the immune system(Bqoor & Albqoor, 2021). Neutrophils can release reactive oxygen species

(ROS), induce cell DNA damage, and release viruses that reside in cells(Velavan & Meyer, 2020). It exposes viral antigens into our system and stimulates cell-specific and humoral immunity. Viral infection triggers an immune response that is primarily based on lymphocytes.

Inflammation due to viral infection causes the NLR to increase, driving the progression of Covid -19. ROC curves were used to analyze the relevant cut-off points. The NLR 3.3 cut-off point specificity for predicting the prognosis of changes in clinical symptoms. Patients over the age of 49 years with a percentage of 46.1% of respondents had an NLR value of 3.3, changing for six days from mild to severe. Inflammation due to viral infection causes the NLR to increase. Respondents under 49 years of age with NLR values less than 3.3 showed clinical improvement and were discharged on day 13.5 of treatment.

The results of this study are expected to be able to assess the prognosis and evaluate the severity of clinical symptoms of Covid-19 cases. NLR and lymphocyte subsets help screen Covid-19 patients in acute illness (Chambergo-Michilot & Chambergo Campos, 2021). In addition, NLR helps to assess systemic inflammation and the severity of viral infection. An elevated NLR indicates a poor prognosis in hepatitis B, high-grade serous ovarian cancer, andacute-chronic liver failure(Leto et al., 2019). Systemic inflammation can be detected by EST and LDH levels(Nasa et al., 2021). D-dimer expresses fibrin degradation after activation of the fibrinolytic system. Coagulation activation is associated with a prolonged inflammatory response and correlates with pathology in Covid -19 patients(Mejia et al., 2021). The results show that >1 g/L D-Dimer has a poor prognosis in the early stages of the disease. The worse prognosis in Covid -19 patients can be inferred from low lymphocytecount and percentage, high NLR, and D-dimer levels(Gold et al., 2021; Shah, 2021). Chest CT scores can also indicate disease severity and clinical features, which are helpful in clinical practice.

**CONCLUSION**

CT scan severity scores were significantly correlated with and haematological findings in COVID-19 patients. Statistic features of chest CT scan and haematological findings determine clinical severity in confirmed Covid-19 patients statistically significant. There is a strong correlation between mortality rate and chest CT scores. A high CT score in the early course of the disease indicates a poor prognosis. Therefore, this study recommends feasible semiquantitative CT scores as a practical prognostic tool for COVID-19.There are several limitations to our research. First, the participants were recruited from a single hospital center which might not represent a large population.

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