

## Factors Affecting the Length of Stay for Covid-19 Sufferers with Cormobid Hypertension

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### ABSTRACT

**Background:** Cormobid, one of the aggravating factors for COVID-19 sufferers, is hypertension. Therefore, cormobid COVID-19 sufferers can have a longer length of stay. Purpose: Thus, the researcher did a study at Soedarso Hospital in Pontianak City to find out what makes COVID-19 sufferers with hypertension cormobid stay in the hospital longer.

**Methods:** The study used a retrospective design with a total sampling method of 204 data (15 March 2021 - 30 April 2022). Data analysis using Spearman test and ETA Correlation.

**Results:** The Spearman test showed that there was a relationship between age (P-value 0.000,  $r = 0.255$ ), leukocytes (P-value 0.000,  $r = 0.513$ ), symptoms of COVID-19 (P-value 0.000,  $r = 0.592$ ), cormobid (P-value 0.002,  $r = 0.300$ ) with length of hospitalization. The ETA test showed a relationship between sex ( $F_{table} > F_{result}$ ,  $3.89 > 8.14$ ) and length of stay. Symptoms of covid-19 are the most related to the standard coefficient of beta 2,559.

**Conclusion:** Factors affecting the length of stay for Covid-19 sufferers are age, gender, leukocytes, symptoms, and cormobid. However, the dominant factor for Covid-19 sufferers is the symptoms of Covid-19.

**Keywords:** covid – 19, hypertension, lenght of stay

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**BACKGROUND**

A mysterious case of pneumonia was first reported in Wuhan, China in December 2019. Five people were suffering an Acute Respiratory Distress Syndrome (ARDS) (Jiang & Wei, 2020; Susilo *et al.*, 2020) WHO declared Corona Virus Disease a world pandemic on March 11, 2020. On February 16, 2022, there were 414 million positive confirmed cases of Covid-19 and 5.83 million people died (WHO, 2022). The first case in Indonesia was confirmed in March 2020. In Indonesia, there are 4.81 million positive cases with a death toll of 145 thousand as of February 16, 2022 (Sebaran, 2021). West Kalimantan ranks sixth as the province with the most additional Covid-19 cases (Dinas Kesehatan Kalimantan Barat, 2021; Jauhari, 2020). Pontianak is the city with the highest number of Covid-19 patients according to data from the West Kalimantan Health Office. The Soedarso Hospital becomes the referral for Covid-19 patients with 2,301 cases from March 2021 - April 2022, where 389 people have finally passed away.

Eighty percent of infected patients suffer from asymptomatic to mild symptoms. 15% of patients have severe conditions that require oxygen therapy assistance. Meanwhile, the rest 5% are critical and must be helped with a ventilator (Setiadi *et al.*, 2020). Someone will be stated as infected with SARS-CoV-2 through RT-PCR (reverse transcriptase polymerase chain reaction) test. The Ct in Covid-19 patients cannot identify the replication of the Covid-19 virus, but its value can be distinguished regarding virus transmission (Manurung & Sukohar, 2021).

Comorbid is a key factor that raises a 2.5 times greater occurrence of worsening prognosis when an individual is infected with Covid-19 (Luo *et al.*, 2020). The most commonly comorbid recorded in dr Soedarso General Hospital is hypertension. This disease increases the ACE II receptor as a place for the virus to bind (Handayani *et al.*, 2020). ACE II regulates blood pressure, electrolyte balance, and regulation in the vascular system (Widuri., 2021). Other influential factors are age and gender (Mi *et al.*, 2020). There are hematological changes such as leukocytes, lymphocytes, neutrophils, and neutrophil-lymphocyte ratio (NLR) (Baihaqi & Rumaropen, 2021; Hernaningsih, 2021; B. Zhu *et al.*, 2021).

Some studies explained clinical symptoms, age, gender, changes in laboratory values (lymphocytes, leukocytes, neutrophils, and neutrophil-lymphocyte ratio / RNL), CT - values, and comorbidities that can affect patients' hospitalization period (Baihaqi & Rumaropen, 2021; Guo *et al.*, 2021; Rao *et al.*, 2020; Zhao *et al.*, 2021). There is an increasing number of hospitalized patients for COVID-19 cases. This situation affects the health services units' workloads in dealing with the COVID-19 pandemic (Baihaqi & Rumaropen, 2021). The hospitalization period for COVID-19 patients can be influenced by the quality of healthcare and geographical conditions. Other matters are the provision of proper policies and the availability of quality resources (Rees *et al.*, 2020).

**OBJECTIVE**

There have been limited studies examining some factors (gender, age, clinical symptoms, CT value, leukocytes, neutrophils, lymphocytes, neutrophil-lymphocyte/RNL ratio, and comorbid) that influence the hospitalization period, especially in hypertensive comorbid patients infected with Covid-19. Their findings can be references for improving existing treatment methods. This research aims to identify the factors that influence the hospitalization period for Covid-19 patients with comorbid hypertension.

## METHODS

### Study Design

This is non-experimental research using a retrospective design. The secondary data are obtained from medical records. The research is conducted at Dr. Soedarso General Hospital of Pontianak City. The population is all Covid-19 patients. The inclusion criteria taken are 1) having a history of hypertension (age more than 25); 2) being declared negative for Covid-19 with a negative RT - PCR test 1 or 2 times; 3) being allowed to go home by the doctor in charge; and 4) having complete medical record data. The exclusion criteria are patients with incomplete medical record data, who have passed away, referred to other hospitals, and those who have gone home at their request.

The dependent variable is the hospitalization period stay for Covid-19 patients having comorbid hypertension (starting from the first day of treatment until they are declared negative for Covid-19 and allowed to go home). The independent ones are age, gender, CT value, number of leukocyte, neutrophil, lymphocyte, neutrophil-lymphocyte ratio (RNL), symptoms of covid-19, and comorbid hypertension without any other diseases.

### Process

This research is done by summarizing the results of the medical records based on the inclusion criteria. The medical records are documented through a checklist which consists of age, gender, CT value, hematological results (leukocytes, neutrophils, lymphocytes, neutrophil-lymphocyte ratio / RNL), symptoms of Covid-19, comorbid, and hospitalization period of the patients declared negative for Covid -19 by RT - PCR tests (negative 1 time / negative twice).

### Data Analysis

Univariate analysis is displaying descriptive results through the percentage frequency for each variable. The variable included in the bivariate analysis will be tested using the Spearman test (variables of age, Ct value, leukocyte, neutrophil, RNL value, symptoms of Covid -19, comorbid hypertension without or accompanied by other diseases with a P value lower than 0,05 ( $\alpha = 5\%$ ). The gender category is tested using the ETA correlation test with a value of F-table higher than F-count. The data are analyzed using multiple linear regression by looking at the P-value lower than 0.05 and the highest correlation coefficient (B) among all the variables that come to the multivariate analysis stage.

## RESULTS

Results describe the major findings of the study. It should be clear, concise and can be reported on texts or graphics. Please provide some introduction for the information presented on tables or images.

**Table 1.** Respondents' Characteristics at Doctor Soedarso Hospital, Pontianak City

| Characteristics                      | N = 204     |
|--------------------------------------|-------------|
| <b>Age (year)</b>                    |             |
| 26 – 45 (n%)                         | 78 (38%)    |
| 46 – 65 (n%)                         | 98 (48%)    |
| > 65 (n%)                            | 28 (13,7%)  |
| <b>Gender</b>                        |             |
| Male (n%)                            | 115 (56,4%) |
| Female (n%)                          | 89 (43,6%)  |
| <b>Hospitalization period (days)</b> | 7 days      |

|                                                   |              |
|---------------------------------------------------|--------------|
| Min (days)                                        | 23 days      |
| Max (days)                                        | 13,50 days   |
| Median (days)                                     | 183 (89,7%)  |
| CT Value                                          |              |
| <b>Hematology</b>                                 | 118 (58,1%)  |
| Number of leukocytes ( > 11.00 [ $10^3$ /UL])     | 115 (56,4%)  |
| Number of Neutrophil ( > 8.0 [ $10^3$ /UL])       | 172 (84,3%)  |
| Number of Lymphocytes (0,90 – 5,20 [ $10^3$ /UL]) | 154 (75,5%)  |
| RNL Value ( > 3)                                  |              |
| <b>Covid – 19 symptom</b>                         | 29 (14,2%)   |
| Mild                                              | 140 (58, 6%) |
| Moderate                                          | 35 (17,2%)   |
| Heavy                                             | -            |
| Critical                                          |              |
| <b>Comorbid</b>                                   | 51 (25%)     |
| Hypertension                                      | 84 (41%)     |
| Hypertension + 1 another diagnose                 | 57 (27,9%)   |
| Hypertension + 2 other diagnoses                  | 12 (5,9%)    |
| Hypertension + 3 other diagnoses                  |              |

The findings indicate the hospitalization period is at least seven days, while the maximum is 23 days. The median value of the hospitalization period of Covid-19 patients with hypertension at Dr. Soedarso Hospital is 13.50 days.

The bivariate analysis uses Spearman's test in age, numbers of leukocytes, and neutrophils, neutrophil-lymphocyte ratio (RNL), symptoms of covid-19, and comorbid. They are significantly related; where the P-value is lower than 0.05. The CT value and the number of lymphocytes show that there is no significant relationship with the hospitalization period with a P-value higher than 0.05. The age ( $r = 0.255$ ), Ct value ( $r = 0.029$ ), neutrophils ( $r = 0.349$ ), and comorbid ( $r = 0.300$ ) have a weak positive correlation coefficient value. On the other hand, leukocyte ( $r = 0.513$ ), and Covid-19 symptoms ( $r = 0.592$ ) have a strong positive correlation coefficient.

**Table 2.** Correlation among age, gender, CT value, hematology results, symptoms of covid-19, and comorbid

| Variable                      |  |  | R       | P – Value |
|-------------------------------|--|--|---------|-----------|
| Age                           |  |  | 0,255   |           |
|                               |  |  | F table | F count   |
| Gender                        |  |  | 3,89    | 8,14      |
|                               |  |  | R       | P – Value |
| CT Value (being hospitalized) |  |  | 0,029   | 0,000*    |
| Hematology results            |  |  | R       | P – Value |

|                                      |        |        |
|--------------------------------------|--------|--------|
| Leukocyte                            | 0,513  | 0,000* |
| Neutrophil                           | 0,349  | 0,000* |
| Lymphocytes                          | -0,033 | 0,640  |
| Neutrophil to Lymphocyte Ratio (RNL) | 0,260  | 0,000* |
| Covid – 19 Symptoms                  | 0,592  | 0,000* |
| Comorbid                             | 0,300  | 0,002* |

**Notes**

F table &gt; F count : correlated

r. correlation coefficient

\* Significant value 0,05

The gender category is analyzed using the ETA correlation test. The results show a significant relationship with hospitalization period (F-table > F-count (3.89 > 8.14)). The results of the multivariate test indicate that the neutrophil value, neutrophil-lymphocyte ratio, and gender do not significantly influence the hospitalization period of Covid-19 patients having hypertension as the comorbid at Dr. Soedarso hospital of Pontianak City. The variables of age, leukocytes, symptoms of Covid-19, and comorbid have a significant relationship with the hospitalization period.

**Table 3.** Multiple Linear Regression Test on variables related to hospitalization

| Model                     | Unstandardized Coefficient |              | Standardized Coefficient | P Value      | P Value (ANOVA) |
|---------------------------|----------------------------|--------------|--------------------------|--------------|-----------------|
|                           | B                          | Std. error   | Beta                     |              |                 |
| Constant                  | -1,066                     | 1,050        |                          | 0,321        | 0,000           |
| Age                       | 1,400                      | 0,261        | 0,266                    | 0,000        |                 |
| Leukocyte                 | 2,196                      | 0,353        | 0,335                    | 0,000        |                 |
| <b>Covid-19 symptoms*</b> | <b>2,559</b>               | <b>0,347</b> | <b>0,401</b>             | <b>0,000</b> |                 |
| Comorbid                  | 0,656                      | 0,211        | 0,159                    | 0,002        |                 |

**DISCUSSION**

The research findings show that the average hospitalization period is 13.50 days. Meanwhile, the results also show that the average hospitalization period for Covid-19 patients with hypertension is 7 days. The longest period is 23 days. These results are in line with previous studies where on average, the patients with hypertension have a one-week (88.1%) and two-week hospitalization period (75.1%). The longest hospitalization period is 26 days (Martínez-botía *et al.*, 2021). Other researchers also explain that patients with hypertension have a hospitalization period of 16.9 to 25.2 days (Jang *et al.*, 2021). This difference may be due to differences in the criteria for patients who can be treated at the hospital, the hospital's policies, supporting facilities, and treatment strategies (Rees *et al.*, 2020; Surendra *et al.*, 2021).

Many factors affect the patients' hospitalization, including CT value, age, gender, hematological results (leukocytes, neutrophils, lymphocytes, neutrophil ratio (RNL)), symptoms of Covid-19, and comorbidities. One of the tests to detect SARS-CoV 2 infection is RT PCR (reverse transcriptase – polymerase chain reaction) which performs a cycle threshold (CT) value (Manurung & Sukohar, 2021). The results of this research explain no relationship between CT value and hospitalization period for Covid-19 patients with hypertension. The findings indicate that the P-value is 0.680. The most dominating patients' age is 45-65 (with

hypertension as the comorbid). This is in line with research conducted in China proving that 40-60 years-old patients experience longer hospital stay compared to those under 60 (Jiang & Wei, 2020). Patients who are older than 65 years old have shorter hospitalization periods because their safety and survival rates are lower (Zilberlicht *et al.*, 2021).

This research shows that males are more vulnerable to being infected with Covid-19 (the value of F-table > F-count ( $3.89 > 8.14$ )). It means the P value is lower than 0.05. China has a much higher percentage of the male group infected with COVID-19 by 60% compared to the female. Also, females have a longer hospitalization than males (Guo *et al.*, 2021). This is mainly because of their biological factors and lifestyle patterns. Biologically, the male has a lower immune system compared to the female, while in terms of lifestyle, males commonly have heavy smoking habits (Hidayani, 2020). The female group has better body protection than the male, and the female has a sex hormone (progesterone) and an X chromosome (Jaillon *et al.*, 2019).

There are different hematological results consisting of leukocytes, neutrophils, lymphocytes, and the neutrophil-lymphocyte ratio (RNL). The leukocytes (p-value= 0.000) and neutrophils (p-value=0.000) showed a significant relationship with the hospitalization period. Changes in the number of leukocytes influence the changes in the immunity of COVID-19 patients. This problem causes higher mortality rates (Z. Zhu *et al.*, 2020). According to Zhang *et al* (2021) , there is a relationship between the hospitalization period and the number of leukocytes and neutrophils. There will be an increase in leukocytes and neutrophils in the first week (days 3 - 7) and a decrease on days 8 – 14 until the patient is declared safe. Some studies prove an increase in leukocytes and neutrophils, and a concomitant decrease in lymphocytes affects the hospitalization period and referral to the intensive care unit (Urbano *et al.*, 2022). Zhu *et al* (2021) stated that the number of leukocytes has an important effect in patients infected with COVID-19 the correlation with the mortality rate. This is due to the invasion of the Covid-19 virus in the respiratory tract helped by ACE II attacking host cells supported by CD147 protein. This process will increase IL 6 (interleukin 6). Meanwhile, the neutrophils will also increase due to the condition of lymphopenia. The COVID-19 infection causes neutrophils to provide direct protection to body tissues (Lim, 2021).

The lymphocyte condition in this research does not influence their relationship with the hospitalization period for COVID-19 patients (P value 0.640). This finding is in line with Qu *et al* (2020) that there was no correlation between lymphocytes and different hospitalization periods but had a correlation with patients' prognosis. The neutrophil-lymphocyte ratio also shows a relationship with the hospitalization period (p-value=0.000). This is similar to another research (Ayu *et al.*, 2021) which stated that there is a relationship between the value of the neutrophil-lymphocyte ratio and the hospitalization period (p-value = 0.008). Other supporting studies also explain that there is a relationship between the neutrophil-lymphocyte ratio (RNL) to the hospitalization period of Covid-19 patients (p-value=0.003) (Liu *et al.*, 2020). The increasing RNL also means the increased inflammatory process and can be a predictor in determining a bad symptom category (Amanda, 2020).

These research findings show a relationship between the clinical symptoms of COVID-19 and the patients' hospitalization period (p-value is 0.000). The results are in line with Arief *et al* (2021) that there is a relationship between clinical symptoms of Covid-19 and hospitalization period (p-value=0.005). It means severe clinical symptoms will impact on longer hospitalization period. Besides, this research shows a significant relationship between hypertension as a comorbid in patients with COVID-19 and the hospitalization period (p-value=0.002). Hypertension is the most common condition found in COVID-19 patients (Steven, 2021).The Covid-19 virus uses the ACE II receptor causing its ineffectiveness in

forming angiotensin so that there is a disruption in homeostasis in the patient's blood pressure and triggers blood pressure increase (Widuri *et al.*, 2021).

The COVID-19 patients experience an increase in angiotensin II, especially in lung tissue. This situation will increase vascular permeability resulting in pulmonary edema with symptoms of breath shortness and pneumonia (Oktaviani *et al.*, 2021).

## CONCLUSION

The research findings conclude that there is a very significant relationship between the clinical symptoms of Covid-19 and the hospitalization period of Covid-19 patients at the Soedarso Hospital, Pontianak City. The gender changes in hematological results (leukocytes, neutrophils, lymphocytes, neutrophil-lymphocyte ratio (RNL), symptoms of Covid-19, and hypertension as a comorbid should be identified as early as possible to reduce the worsening rate of the patients' prognosis and improve the care quality. During the hospitalization period, further research should be able to analyze other factors that greatly influence the hospitalization period, especially in patients having hypertension as a comorbid.

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## CONFLICT OF INTEREST

There are no element of interest and conflict in this research.

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