Correlation between hematologic profile and transaminase enzymes with hospitalization duration dengue

E Tinambunan1*, Suryani2, S Katu2, R Halim2, A H Mubin2 and Sahyuddin2

1Division of Infectious and Tropical Diseases, Department of Internal Medicine, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia
2Division of Hematology and Medical Oncology, Department of Internal Medicine, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia
*Corresponding author: erwintinambunandr@gmail.com

Abstract. Dengue is an infectious disease that can be found from mild to severe and affected the clinical spectrum of the disease. Various hematologic profiles and transaminase enzymes are thought to reflect the severity of the disease thus affecting the hospitalization duration. For determining the correlation between hematological profile and transaminase enzyme to the hospitalization duration in dengue patients, an observational design study with the cross-sectional approach on dengue subjects was from 2 hospitals in Makassar. Hemoglobin, leukocyte, thrombocyte, AST, ALT, PT, and APTT were examined for hospitalization duration. There were 65 samples (34 men, 31 women) with the length of stay <5 days 34 people and ≥ 5 days 31 people. The result of the analysis showed that there was a low correlation of leukocyte value (p = 0.036) and APTT prolongation (p = 0.023) with hospitalization duration of dengue patients. There was no correlation between the elevated of hematocrit value (p = 0.429), thrombocytopenia (p = 1.000), elevated of AST (p = 0.456) and ALT (p = 0.285) on hospitalization duration. In conclusion, low leukocyte values and APTT prolongation correlate with hospitalization duration but did not correlate significantly with hospitalization duration for elevated hematocrit, thrombocytopenia, elevated AST, and ALT.

1. Introduction
Dengue is a common public health problem in tropical and subtropical regions of the world.1 This disease spreads rapidly and is the most frequent viral disease transmitted by mosquitoes with a 30-fold increase in the last 50 years.1 From the record by The Ministry of Health, the number of DHF patients in Indonesia from January-February 2016 are 8,487 people with 108 deaths.2

Dengue is an acute viral disease transmitted by Aedes aegypti mosquitoes, and Aedes albopictus.3 Dengue is an infectious disease with clinical manifestation from mild to severely affected the clinical spectrum of the disease.4,5,6,7

Laboratory results that can be used to predict the severity of the disease are leukopenia, thrombocytopenia, hemoconcentration, prolongation of prothrombin time (PT) and activated partial thromboplastin time (APTT), elevated serum aspartate aminotransferase serum (AST) and serum alanine aminotransferase (ALT).8
A study conducted by Ita officer at Jakarta Persahabatan Hospital found there is a correlation between low platelet count and hospitalization duration.\textsuperscript{9} From the study conducted at Dr. KariadiSemarang (hospital) by HasriNopianto, there is significant correlation between low platelet count and leukocyte with the prolongation of treatment.\textsuperscript{10}

This study aims to explain the correlation between hematological profile and transaminase enzyme on hospitalization duration in dengue patients treated in hospital.

2. Method
This study used observational design with the cross sectional approach. The study was at two referral hospitals in Makassar city, Hasanuddin University Hospital, and Dr. WahidinSudirohusodo from 1 January 2017-30 May 2017. The study population was ≥ 17 years old patient who was with dengue diagnosed by definitive examination of NS1 antigen and IgG and IgM anti-dengue. Sampling was a consecutive sampling of 65 samples. Exclusion criteria including patients with a history of blood disorders, hepatic cirrhosis, chronic kidney disease, who rejected medical treatment furthermore or dead during hospitalization, patients that not yet outpatient, inpatient requirements for recovery and administration and health insurance problems. Before researching, Ethical clearance was obtained first from the Commission of Ethics of Biomedical Research on Human, Faculty of Medicine, Hasanuddin University, Makassar. After that, the researcher explained to the respondent about the aim, benefit of research, and data collection procedure. The data is by using Chi-Square statistical test with a degree of trust 95%.

3. Results
Hospitalization duration between 2 to 8 days with an average of 5±1.5 days. In the laboratory profile of research subject examined at the time of admission. The hematocrit values ranged from 31\% to 54\% with an average of 41.4\%, platelet counts of 10,000/μL to 256,000/μL with an average of 99,046.2, 9 U/L to 910 U/L with an average of 93.9 U/L, the value of ALT 7 U/L up to 667 U/L with an average of 86.7 U/L, PT value of 9.6 seconds up to 16.2 seconds with an average of 12.0 seconds and an APTT of 23.3 seconds 47.0 seconds with an average of 32.5 seconds (Table 1).

| Variable                  | Minimum | Maximum   | Mean      | SD      |
|---------------------------|---------|-----------|-----------|---------|
| Age                       | 18      | 643       | 0.51      | 3.2     |
| Hospitalization duration  | 2       | 8         | 5.0       | 1.5     |
| Hemoglobin                | 10.5    | 19.1      | 13.9      | 2.0     |
| Hematocrit                | 31      | 54        | 41.4      | 5.2     |
| Platelet counts           | 10000   | 256000    | 99046.2   | 59365.0 |
| ALT                       | 9       | 910       | 93.9      | 124.3   |
| AST                       | 7       | 667       | 86.7      | 110.9   |
| PT                        | 9.6     | 16.2      | 12.0      | 1.5     |
| APTT                      | 23.3    | 47.0      | 32.5      | 5.8     |

Result of statistic test showed that there was a correlation between low leukocyte value (\(p = 0.036\)) and APTT prolongation (\(p = 0.023\)) with hospitalization duration of dengue patient. There was no correlation between elevated hematocrit (\(p = 0.429\)), thrombocytopenia (\(p = 1.000\)), elevated AST (\(p = 0.456\)) and ALT (\(p = 0.285\)) with hospitalization duration in dengue patients (Table 2). The result of statistic test showed that there was a correlation between low leukocyte value (\(p = 0.036\)) and APTT prolongation (\(p = 0.023\)) with hospitalization duration of dengue patient. There was no correlation of elevated hematocrit (\(p = 0.429\)), thrombocytopenia (\(p =
1.000), elevated AST (p = 0.456) and ALT (p = 0.285) with hospitalization duration in dengue patients (Table 2).

**Table 2.** Correlation of hematology profiles and transaminase enzymes of hospitalization duration.

| Laboratory Profile     | Hospitalization Duration | Total | p     |
|------------------------|--------------------------|-------|-------|
|                        | < 5 days | ≥ 5 days |       |
| Hematocrit             |           |         |       |
| High (≥ 20%)           | 10 (45.5%) | 12 (54.5%) | 22 (100%) | 0.429 |
| Normal (< 20%)         | 24 (55.8%) | 19 (44.2%) | 43 (100%) |
| Platelet counts        |           |         |       |
| Low (< 150,000/µL)     | 29 (52.7%) | 26 (47.3%) | 55 (100%) | 1.000 |
| Normal (≥ 150,000/µL)  | 5 (50.0%) | 5 (50.0%) | 10 (100%) |
| Leucocyte              |           |         |       |
| Low (< 4000/µL)        | 12 (38.7%) | 19 (61.3%) | 31 (100%) | 0.036 |
| Normal (≥ 4000/µL)     | 22 (64.7%) | 12 (35.3%) | 34 (100%) |
| ALT                    |           |         |       |
| High (> 40 U/L)        | 24 (53.3%) | 21 (46.7%) | .45 (100%) | 0.456 |
| Normal (≤ 40 U/L)      | 10 (50.0%) | 10 (50.0%) | 20 (100%) |
| AST                    |           |         |       |
| High (> 40 U/L)        | 22 (57.9%) | 16 (42.1%) | 38 (100%) | 0.285 |
| Normal (≤ 40 U/L)      | 12 (44.4%) | 15 (55.6%) | 27 (100%) |
| PT                     |           |         |       |
| Prolonged (> 17 second)| 0 (0%) | 0 (0%) | .0 (0%) |
| Normal (≤ 17 second)   | 34 (52.3%) | 31 (47.7%) | 65 (100%) |
| APTT                   |           |         |       |
| Prolonged (> 17 second)| 1 (12.5%) | 7 (87.5%) | 8 (100%) | 0.023 |
| Normal (≤ 17 second)   | 33 (57.9%) | 24 (42.1%) | 57 (100%) |

### 4. Discussion

#### 4.1. The correlation of thrombocytopenia at admission to hospitalization duration

Thrombocytopenia has always been one of the criteria used by WHO guidelines as a potential indicator of clinical severity. Thrombocytopenia is a prominent feature of dengue infection. In this study, there was no correlation of thrombocytopenia concerning hospitalization duration (p = 1.000). The results of this study are not in line with the KishanJayanthi et al.’s study, where there was a statistically significant positive correlation between platelet counts and their complications in which platelet loss correlated with hospitalization duration.

#### 4.2. The correlation of low leukocyte values at admission to hospitalization duration

Changes in the total number of leukocytes (≤ 5000) and the ratio of neutrophils to lymphocytes were useful in predicting the critical period of plasma leakage. In this study, there was a significant correlation between low leukocyte values of hospitalization duration in dengue-infected patients (p = 0.036). The percentage of patients treated ≥ 5 days was higher at lower leukocyte values than patients with normal leukocyte values.

#### 4.3. The correlation of elevated hematocrit at the time of admission to the hospitalization duration

In this study, there was no significant correlation between the elevation of hematocrit on the hospitalization duration (p = 0.429). A similar case was also in a study conducted by HasriNopianto in Dr. Kariadi Semarang which also found no significant correlation between the elevation of hematocrit on hospitalization duration.
4.4. The correlation at the APTT prolongation of admission to hospitalization duration
In this study found a significant correlation between the prolongation of APTT on the hospitalization duration (p = 0.023). In a study conducted by Muhammad Abdul Mabood Khalil et al. also showed a prolongation of APTT related to hospitalization duration.\textsuperscript{14} Bleeding manifestations isa clinical feature of DHF.\textsuperscript{15} Mostly due to thrombocytopenia occurring in the subjects.\textsuperscript{14} However, the proportion of bleeding manifestations which is significant due to the presence of coagulopathy associated with DHF.\textsuperscript{15}

4.5. The correlation of elevated AST and ALT of admission to hospitalization duration
In this study, it was found that dengue patients with elevated AST by 45 subjects (69%) and dengue patients with elevated ALT of 38 subjects (58.4%) who showed more patients who experienced elevated AST than ALT. However, there was no significant correlation between AST and ALT on the duration of treatment (p>0.05). Different results were found in a study conducted by Asim Ahmed et al., Where the study showed a long-term positive correlated care for elevated ALT and an increased risk of complications.\textsuperscript{16}

5. Conclusion
From this study, there was a significant correlation between low leukocyte value and APTT prolongation on hospitalization duration of dengue patients. However, there was no significant correlation between the hospitalization duration on the elevated of hematocrit, thrombocytopenia, elevated AST and ALT.

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