Journal of Applied Chemistry and Biomedical Laboratory Research
https://doi.org/00.0000/0000-000-000
eISSN xxxx-xxxx

Open Access

Correlation of Platelet Count and Liver Enzymes in Dengue Hemorrhagic Fever Patients

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Received: June 26, 2025
Accepted: June 27, 2025
Published online: June 30, 2025

ABSTRACT

Introduction: Dengue Hemorrhagic Fever (DHF) is one of the endemic diseases throughout the tropics and some subtropics. DHF can affect liver enzyme levels, causing SGOT and SGPT levels in the body to increase along with the severity of DHF as indicated by a decrease in the number of platelets. A study has been conducted on the relationship between platelet values and SGOT and SGPT levels. **Materials and Methods:** Platelets were counted using a hematology analyzer and SGOT and SGPT activities were measured using the IFCC method. The study was conducted on 38 outpatients at the Simpang Joglo Clinic. Data were processed using SPSS 23 to obtain the relationship between each parameter. The Spearman-rho non-parametric correlation test was used to analyze this relationship. **Results:** A significant relationship was found between platelet valuesand SGOT activity (Sig. value 0.000 <0.05) with a strong negative correlation degree. A significant relationship was found between platelet values and SGPT activity (Sig. (2-tailed) value is 0.000 < 0.05). With a strong correlation degree (-0.608) and a negative direction: meaning that if the platelet value increases, then SGPT decreases. A significant relationship was found between SGOT activity valuesand SGPT activity, there is a significant relationship because the Sig. (2-tailed) value is 0.000 < 0.05. With a strong correlation degree (0.934) and a positive direction: meaning that if SGOT activity increases, then SGPT activity also increases. **Conclusion:** There is a close relationship between liver function and the severity of DHF, it is a good idea to conduct research on the relationship between albumin, globulin, and total bilirubin levels and the severity of DHF.

Keywords: Dengue Hemorrhagic Fever, Platelet Values, SGOT, SGPT

Citation:
Khairrunissa L, & Pudjiastuty DR. Correlation of platelet count and liver enzymes in dengue hemorrhagic fever patients. J Appl Chem Biomed Lab Res (JACBioLab). 2025;1(1):25-30. https://doi.

INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is one of the endemic diseases throughout the tropics and some subtropics. The disease transmitted by the Aedes aegypti mosquito is a frightening disease because it can spread quickly in an area. Even in one month, the number of DHF cases in endemic areas can reach dozens of people infected with the dengue virus [1].

Platelets may often be forgotten in discussions about health. In fact, their role in the body is very important. These small cells are responsible for the blood clotting process and wound healing, ensuring the body can recover quickly from injury and preventing excessive bleeding. Without properly functioning platelets, our bodies will have

difficulty maintaining balance and dealing with various health problems. The normal platelet count ranges from 150,000 to 400,000 pieces per microliter of blood. Platelet function is very important in blood clotting, fighting infection, and supporting the wound healing process [2].

Serum glutamic oxaloacetic transaminase or SGOT is an enzyme that is often found in the liver. However, this enzyme can also be found in other parts of the body, such as the brain, pancreas, kidneys, muscles, and other tissues in the body. SGOT is also known as AST (aspartate transferase). Meanwhile, SGPT (serum glutamic pyruvic transaminase) is an enzyme produced by the liver, which can be found in which is useful for breaking down proteins into energy for cells in the liver. Normally, these two enzymes are only found in small amounts in the blood. However, when liver function is disrupted, the amount of SGOT and SGPT in the blood can increase [3].

Dengue Hemorrhagic Fever (DHF) is an arbovirus infection caused by the bite of the aedes aegypti mosquito that can be transmitted to humans. Dengue fever is an endemic disease and about half of the world's population is currently susceptible to dengue fever infection with an estimated 100 to 400 million new infections occurring annually. Dengue fever occurs globally and is hyperendemic in tropical and subtropical climates that are at higher risk than other areas, especially in urban and semi-urban areas. Dengue fever cases can appear as mild infections without symptoms to severe diseases that can cause death in some cases. WHO stated that the highest number of dengue fever cases occurred in 2023 across all WHO regions affecting more than 80 countries. Transmission and increase in dengue fever cases continue to occur and have resulted in the highest record in history, namely 6.5 million cases and 7300 deaths reported since early 2023 [4]. Dengue fever can affect liver enzyme levels, causing SGOT and SGPT levels in the body to increase along with the increasing severity of dengue fever as indicated by a decrease in the number of platelets. SGOT levels increased in 91% and SGPT increased in 78% of cases. SGOT levels appear to increase by more than half in most cases. Some of these cases show a 1.5 to 3-fold increase in transaminase levels. Impaired liver function in DHF can occur due to direct damage to liver cells caused by the virus or due to reactive hepatitis. Increased liver enzymes usually occur between the third and fifth days after fever.

Patients with increased liver enzymes during fever are at high risk of complications and require careful management during the critical period. Around 60-90% of patients infected with DHF experience DHF complications including hepatomegaly, jaundice, increased serum glutamic oxaloacetic transaminase (SGOT), increased serum glutamic pyruvate transaminase (SGPT), and acute liver failure (ALF) [5].

Based on the high incidence of Dengue Hemorrhagic Fever (DHF) in Indonesia and supported by Indonesia's geographical conditions which allow the spread of Dengue Hemorrhagic Fever (DHF) to increase, researchers want to know the relationship between platelet count and SGPT and SGOT levels in DHF patients, with the hope that this study can be a reference for further research and become a reference in establishing the diagnosis and management of DHF. The results of previous research regarding the relationship between SGPT and SGOT levels and platelet count in DHF patients at the NTB General Hospital explained that the incidence of Dengue Hemorrhagic Fever with thrombocytopenia and accompanied by an increase in transaminase enzymes from 77 samples, 56 people experienced abnormal platelets, namely a decrease in platelet levels <150,000 U/L accompanied by abnormal SGPT levels, namely an increase in SGPT levels> 40 U/L and there were 53 people with abnormal platelets, namely a decrease platelets <150,000 U/L accompanied by abnormal SGOT, namely an increase in SGOT> 45 U/L [6]. Based on previous research and references related to each other, a study was conducted entitled The Relationship between the Number of Platelet Values and SGOT and SGPT Levels in Dengue Fever Patients.

MATERIALS AND METHODS

This research is a quantitative correlational research with a cross-sectional research design that aims to see the relationship between platelet count values and SGOT and SGPT levels in Dengue Hemorrhagic Fever (DHF) Patients at the Simpang Joglo Clinic. This research was conducted at the Simpang Joglo Clinic Laboratory. The research was conducted in November 2024. The population is the total number of objects to be studied. The population of this study is all patients with Dengue Hemorrhagic Fever (DHF) at the Simpang Joglo Inpatient Clinic in November. The sample is part of the number and characteristics of the population. Samples were taken from patients who had just had Dengue Hemorrhagic Fever (DHF) at the Simpang Joglo Clinic. The sample size taken in this study was 38 people.Platelet Count Examination. Method: Impedance. Principle: Cells are counted and measured based on the measurement of changes in electrical resistance produced by particles. In this case, namely, red blood cells suspended in a conductive dilution when passing through a dimensional gap. Blood cells that pass through a gap with electrodes on both sides will experience changes in impedance that produce measurable electrical vibrations according to the volume and size of the cells. The principle of measuring these cells depends on the size of the surface area, and the presence of granules in the cells. SGOT and SGPT

determination are carried out using Method: Kinetic-IFCC (without pyroxidal-5-phosphate) For SGOT: Principle: L-aspartate and 2-oxoglutarate with the help of AST enzyme will become oxaloacetate and L-glutamate. The formed oxaloacetate will reduce NADH with the help of malate dehydrogenase (MDH) enzyme to L-malate and NAD^+. The catalytic activity of AST is determined by measuring the decrease in absorbance.For SGPT: Principle: L-alanine and 2-oxoglutarate with the help of ALT enzyme will become L-glutamate. The pyruvate formed will reduce NADH with the help of lactate dehydrogenase (LDH) enzyme to form L-lactate and NAD^+. The catalytic activity of ALT is determined by measuring the decrease in absorbance.

RESULTS AND DISCUSSION

From the research conducted on 38 samples examined at the Simpang Joglo Clinical Laboratory in November 2024, the following examination results were obtained:

Table 1. Liver Enzymes Examination Data

	Age (years)	Trombosit (mcL)	SGOT (IU/L)	SGPT (IU/L)
Mean	22	111.394	93.14	92.07
Minimum	17	88.000	36.16	32,25
Maximum	30	149.000	178.54	186,02
Standard Deviation		168.811,42	40,83	41,69
Patients with Below Normal Thrombocytes		38 people (100%)		
Patients with Above Normal SGOT			38 people (100%)	
Patients with Above Normal SGPT				36 people (95%)
Percentage of Low Thrombocytes below 150.000 mcL		25,74%		
Percentage of High SGOT Above Normal (35 IU/L)			100%	
Percentage of High SGPT Above Normal (35 IU/L)				100%

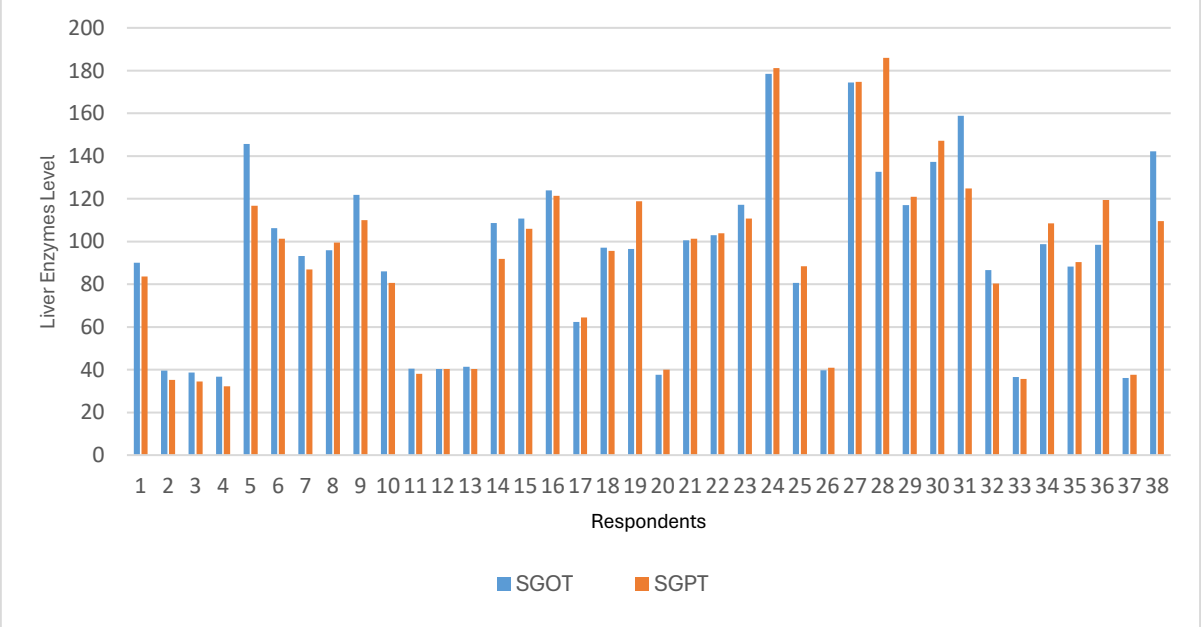

Figure 1. Graph of Liver Enzyme Values

To find out whether or not there is a correlation between parameters, a correlation test is carried out. Before conducting a correlation test, there is a prerequisite test that must be met, namely the Data Normality Test.

Table 2. Normality Test

	Kelompok	**Shapiro-Wilk**		
		Statistic	df	Sig.
Data	Trombosit	0.931	37	0,024
	SGOT	0.930	38	0,020
	SGPT	0.922	38	0,012

*Sig. value (P value) <0.05 concludes that the data is not normally distributed

The Shapiro-Wilk normality test is taken, because the data size is small (<50 data). It can be concluded that from the Significance value (column "Sig.") platelets are 0.024 <0.05; SGOT significance value 0.020 <0.05; SGPT significance value 0.012 <0.05, it is concluded: the data group is not normally distributed.

The correlation test conducted was the Spearman test because the data group to be tested was not normally distributed.

Table 3. Correlation Test Sperman-rho :

		Correlation			
			Trombosit	SGOT	SGPT
Spearman's rho	Trombosit	Correlation Coefficient	1.000	-.710**	-.608**
		Sig. (2-tailed)	.	0.000	0.000
		N	38	38	38
	SGOT	Correlation Coefficient	-.710**	1.000	0.934**
		Sig. (2-tailed)	0.000	.	0.000
		N	38	38	38
	SGPT	Correlation Coefficient	-.608**	.934**	1.000
		Sig. (2-tailed)	0.000	0.000	.
		N	38	38	38

** Correlation is significant at the 0.01 level (2-tailed).

1. There is a significant relationship between platelet values and SGOT activity because the Sig. (2-tailed) value is 0.000 < 0.05. With a strong correlation degree (-0.710) and a negative direction: meaning that if the platelet value decreases, then SGOT increases.
2. There is a significant relationship between platelet values and SGPT activity because the Sig. (2-tailed) value is 0.000 < 0.05. With a strong correlation degree (-0.608) and a negative direction: meaning that if the platelet value decreases, then SGPT increases.
3. There is a significant relationship between SGOT activity values and SGPT activity because the Sig. (2-tailed) value is 0.000 < 0.05. With a strong correlation degree (0.934) and a positive direction: meaning that if SGOT activity increases, then SGPT activity also increases.

From the results of measurement data and statistical processing, it was found that the average age of DHF patients was 22 years, with the youngest being 17 years old and the oldest being 30 years old. The average platelet value was 111,394 mcL, the lowest platelet value was 88,000 mcL, the highest was 149,000 mcL, the average SGOT activity was 93.14 IU/L, the lowest was 36.16 IU/L, the highest was 178.54 IU/L. The average SGPT activity was 92.06 IU/L and the lowest was 32.25 IU/L, the highest was 186.02 IU/L. Patients with platelet values below the average were 100% of the sample, patients with SGOT values above the average were 100%, and patients with SGPT above the average were 95%. With an average percentage of platelet decrease of 24.74%, an average increase in SGOT of 200.46%, an average increase in SGPT of 162.30%.

Dengue hemorrhagic fever (DHF) is characterized by a decrease in platelet count. Normal platelet count is 150,000 – 400,000 mcL. The data above shows that the average platelet count is 111,394 mcL. Not all cases of decreased platelet count are DHF, but in this data the patient has been determined to have DHF. Thrombocytopenia plays an important role in the etiology of DHF and in the pathophysiology of dengue infection. Thrombocytopenia is defined as a decrease in platelet count below 150,000 mcL. Decreased platelet count is a very common clinical manifestation in dengue fever. Although there are several hypotheses, the mechanisms involved in thrombocytopenia and bleeding manifestations during DHF infection are not fully understood. By disrupting its

function, DHF can directly or indirectly affect bone marrow progenitor cells to reduce the proliferation capacity of hematopoietic cells. Evidence suggests that DHF can induce bone marrow hypoplasia during the acute phase of the disease. Thrombocytopenia in dengue fever can arise either from decreased cell production from the bone marrow or from increased peripheral destruction of platelets and clearance from the peripheral blood. A high mean platelet volume (MPV) indicates increased platelet destruction in patients. MPV is usually high or normal in dengue patients; therefore, excessive platelet destruction may be the main reason for thrombocytopenia in dengue patients.

This study also found that the average increase in SGOT enzyme from the upper limit of normal activity was 200.64% (an increase of more than twofold), and for SGPT it was 162.30% (an increase of almost twofold). This is different from liver injury due to other viral infections. Liver injury due to dengue infection has been reported since 1967. Liver dysfunction varies from mild injury with increased transaminases to severe hepatocyte injury, resulting in jaundice. Direct hepatotoxicity as well as impaired host immune response to the virus are responsible for liver dysfunction.

This is in line with previous research which showed that the increase in SGOT enzyme activity was higher than the increase in SGPT enzyme activity in DHF cases which distinguishes it from other viral infections [6].

The broad spectrum of liver dysfunction in dengue fever varies from asymptomatic transaminase elevations to fatal liver failure. Plausible mechanisms include the release of SGOT from damaged erythrocytes, cardiac muscle cells and skeletal muscle cells. This pattern of SGOT/SGPT disturbances, together with the presence of thrombocytopenia and persistent fever even after the appearance of jaundice, may indicate dengue infection when the presentation and laboratory parameters resemble acute viral hepatitis [7].

This study also found a significant relationship between platelet values and SGOT and SGPT levels. In this study, an increase in SGOT and SGPT levels was found along with an increase in the severity of dengue fever as indicated by a decrease in platelet count because both were negatively correlated with each other.

Several mechanisms responsible for liver injury in dengue fever such as direct viral cytopathic effects, immune-mediated injury, and hypoperfusion. Dengue fever is also known to cause microcirculatory dysfunction due to venular or sinusoidal endothelial injury that can lead to hepatocyte ischemia, regardless of the presence of hypotension. In endemic areas, dengue fever can cause worsening of chronic liver disease e.g causes chronic acute liver failure [7].

CONCLUSIONS

There is a significant relationship between platelet values and SGOT activity because the Sig. (2-tailed) value is 0.000 < 0.05. With a strong correlation degree (-0.710) and a negative direction: meaning that if the platelet value decreases, then SGOT increases.

There is a significant relationship between platelet values and activity because the Sig. (2-tailed) value is 0.000 < 0.05. With a strong correlation degree (-0.608) and a negative direction: meaning that if the platelet value decreases, then SGPT increases.

There is a significant relationship between SGOT activity values and SGPT activity because the Sig. (2-tailed) value is 0.000 < 0.05. With a strong correlation degree (0.934) and a positive direction: meaning that if SGOT activity increases, then SGPT activity also increases.

The limitations of the study include the small sample size, perhaps statistically less accurate compared to studies with a larger population and our study is a retrospective study. Patients were selected from a population of patients treated on an outpatient basis. Therefore, the results of the study may not accurately represent the entire population

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