Relationship Between Increased Levels of Hepar Transaminase Enzymes and The Severity of Dengue Infection in Pediatric Patients

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Abstract. Dengue is an infectious disease occurring worldwide. This infection is caused by the dengue virus transmitted by Aedes aegypti and Aedes albopictus mosquitoes. Dengue infection is recorded to reach as many as 400 million cases annually, with 100 million patients experiencing symptoms due to the infection, and 40,000 people dying from severe dengue. One of the warning signs of dengue infection is the enlargement of the liver (>2cm). This hepatomegaly condition indicates liver damage identified through physical examination by palpation of the liver. To assess liver damage causing a decrease in liver function, laboratory tests such as SGOT and SGPT are required. This study is an observational analytical research employing a cross-sectional approach. The study is prospective cohort. Bivariate analysis was conducted using Spearman's test. In the test of the relationship between the severity of dengue and the increase in SGOT, a p-value of 0.239 was obtained ($p > 0.05$). In the test of the relationship between the severity of dengue and the increase in SGPT, a p-value of 0.153 was obtained ($p > 0.05$). There is no correlation between the increase in hepatic transaminase enzymes and the severity of dengue infection in pediatric patients at Abdul Moeloek Hospital in Bandar Lampung in 2023.

Keywords : *ALT, AST, Dengue, Pediatric*

INTRODUCTION

Dengue is an infectious disease with a worldwide occurrence. This infection is caused by the dengue virus and is transmitted to humans through mosquito vectors from the species *Aedes aegypti* and *Aedes albopictus*. The dengue virus has 4 main serotypes, being DENV 1, DENV 2, DENV 3, and DENV 4 [1].

Dengue infection is recorded to reach as much as 400 million cases every year with as many as 100 million people developing symptoms of infection and 40.000 people dying worldwide due to severe dengue. The highest incidence is in tropical and subtropical countries [2][3]. Global dengue infection is still a serious problem far from

D. W. S. R. Wardani and S. Hadi (eds.), *Proceedings of the International Conference on Medical Science and Health (ICOMESH 2024)*, Advances in Health Sciences Research 82,
https://doi.org/10.2991/978-94-6463-604-8_4

being controlled. One of the countries with the highest incidence rates for dengue infection is Indonesia. Every year Indonesia is hit by a dengue epidemic. In 2022, there were as many as 143 thousand recorded cases of dengue in Indonesia. The highest incidence were in the provinces of West Java, East Java, and Central Java. As many as 35.594 cases occurred in West Java. The Province of Lampung places as the 9th highest incidence of dengue infection in Indonesia reaching a total of 4663 recorded cases in the timespan of a year [4].

The level of viremia is reported to be related to the involvement of other organ damage. The most common example of this organ involvement would be damage to the brain and the liver. Disturbance to the liver is caused by direct toxicity from the DENV. Aside from that, liver damage could also be caused by dysregulation of the immune response in combating the viral infection [5]. In 1967, the first case of liver involvement in relation to a patient with dengue infection was reported. As many as 60%-90% of patients infected with the dengue virus were purported to have complications involving the liver organ, those complications being among others: hepatomegaly, jaundice, increase in Serum Glutamic Oxaloacetic Transaminase (SGOT), Serum Glutamic Pyruvic Transaminase (SGPT), or even acute liver failure [5].

In many cases of dengue infections, there exists warning signs that would indicate the need for careful observation to be conducted or even whether or not the process of referral to a higher medical facility for intensive care would be required. Warning signs in dengue infections are made up of symptoms, signs, as well as lab results. One of the warning signs of a dengue infection is an increase to the liver size of >2 cm. This hepatomegaly signifies that there is damage to the liver that could be identified by a physical examination in the form of liver palpations. To gauge whether or not there is damage to the liver that would lead to a decrease in liver function, a laboratory test on the SGOT and SGPT levels would be required [6].

There are many cases of reported dengue infection in the Abdul Moeloek General Regional Hospital. However, data on the incidence of dengue infection in 2023 is yet to be available. Based on what has been presented above, the author is interested in conducting a study on the correltion between an increase in SGOT/SGPT transaminase liver enzymes and the degree of severity of dengue infections in patients in Abdul Moeloek General Regional Hospital in 2023.

SUBJECT METHOD

This study is an observational analytical research employing a cross-sectional approach. The study is prospective cohort viewing first the underlying factors before analyzing the effect of the case for a certain period of time. The bivariate analysis was conducted using the Spearman's test in order to compare the relation between the increase in SGOT (AST)/SGPT (ALT) transaminase on the degree of severity in dengue patients in Abdoel Moeloek General Regional Hospital in 2023.

RESULT

Table 1: Frequency Distribution of Patientsbased on age and sex.

Category	Frequency		Age (Years)		
	n	%	Mean	Min	Max
Male	10	71	7	1	15
Female	4	29	6	3	8
Total	14	100			

Based on table 1, the patient frequency distribution was compiled based on age and sex with 10 male patients (71%) and 4 female patients (29%). The average age of the male patients was 7 while it was 6 for the female patients. The minimum age for the male patients was 1 year old while for the females it was 3 years old. The maximum age of the patients was 15 years for the male patients and 8 years for the female patients.

Table 2: Patient Frequency Distribution based on degree of severity of Dengue infection.

Classification	Frequency	
	n	%
Dengue without *warning signs*	3	21,4
Dengue with *warning signs*	6	42,9
Severe Dengue	5	35,7
Total	14	100

Based on table 2, it was discovered that the highest degree of severity for Dengue infection was *Dengue with warning signs* with as many as 6 patients (42,9%),followed by *Severe Dengue* with 5 patients (35,7%), and finally *Dengue* without *warning signs* with 3 patients (21,4%).

Table 3: Correlation between severity of *Dengue* infection with the increase of concentration levels of Transaminase Liver enzymes.

Variable	*p*	R
Correlation between dengue infection severity with increase of SGOT	0,239	0,337
Correlation between dengue infection severity with increase of SGPT	0,153	0,403

Based on table 3, the bivariate analysis of correlation between dengue infection severity with increase of SGOT yielded a p-value result of 0,239 (p > 0,05) which meant that this study accepted the H0 premise and rejected the H1 premise. Based on said results, it was concluded that there was no correlation between the increase of SGOT with the severity of dengue infection.

Again, based on table 3, the bivariate analysis of correlation between dengue infection severity with increase of SGPT yielded a p-value result of 0,153 (p > 0,05) which meant that this study accepted the H0 premise and rejected the H1 premise. Based on said results, it was concluded that there was no correlation between the increase of SGPT with the severity of dengue infection.

DISCUSSION

The degree of severity for dengue infections are divided into three categories and they are: dengue without warning signs, dengue with warning signs, and severe dengue. Warning signs of dengue in patients could manifest from the 3rd to 7th days after the appearance of symptoms in patients. Warning signs in dengue infections could be seen based on the patient's clinical condition as well laboratory findings and they are comprised of persistent vomiting, abdominal pain or tenderness, lethargy, mucosal bleeding (bleeding from the gums, nose, conjunctiva/subconjunctiva, or ptechiae/ purpuras), liver size increase of more than 2cm, accumulation of fluids such as palpebral oedema, pleural effusion, ascites. Laboratory findings are for example: progressive increase in haematocrit levels or a sharp decrease in platelet counts. This increase in haematocrit levels is a sign of plasma leakage within the patient which could lead to dehydration and eventually to hypovolemic [6].

Based on the results of the study, it was found that the degree of severity for dengue infections in patients of the Abdul Moeloek General Regional Hospital in 2023 were: 6 patients without warning signs (42,9%), 5 patients with severe dengue (35,7%), and 3 patients with warning signs (21,4%). This study yielded a p value of 0,239 (p>0,05) in relation between the degree of dengue with the concentration of SGOT (AST) while the relation between dengue severity and SGPT (ALT) concentration yielded a p value of 0,153 (p>0,05). Based on the results, it could be concluded that there is no correlation between increase in transaminase SGOT/SGPT liver enzymes with the severity of dengue in patients in Abdul Moeloek General Regional Hospital in 2023.

This research is in line with an earlier study by Nurmala (2013) which studied SGOT and SGPT enzyme activity on people with dengue infection. This earlier study suggested that dengue infections caused an increase in SGOT levels but this increase wasn't directly proportional with the increase of the degree of severity of the dengue infection. This earlier study found that Grade I DHF had an average SGOT levels of 124,96 U/L, Grade II DHF had 87,5 U/L, while Grade III DHF had 89,6 U/Liter) [7].

Differing from that is another study by Joseph et al (2020) on the increase of liver enzymes in cases of dengue fever in children. This study showed that an increase in SGPT occurred more frequently compared to the SGOT levels. The second highest increase of liver enzymes occurred on the 5th and 6th day after the onset of fever. According to the study, in severe dengue where liver enzyme levels were observed each day, The first day had no increase in liver enzyme levels, followed by a 20% increase

on the second day, a 38% increase on the third day, a 51% increase on the fourth day, a 90% increase on the fifth day, and finally an 88% increase on the sixth day. This daily increase in enzyme levels were related to the severity of the dengue infection [8].

The author suspects that there are a few factors influencing the findings of the research and they are among others: the meagre amount of samples obtained. This could occur due to the limited amount of SGOT and SGPT transaminase liver enzyme examinations conducted on dengue infected patients. Another factor would be the discrepancy between the taking of the SGOT and SGPT transaminase liver enzyme sample with the course of the dengue infection.

In dengue infections, the hepatocyte cells are the ones infected by the dengue virus. This virus would then influence the process of RNA synthesis as well as protein synthesis in the cell. The activity of the dengue virus in the hepatocyte cell causes the death and destruction of the cell. The liver contains the SGOT and SGPT enzymes which in normal conditions would remain within the liver. However, when the dengue virus infects the hepatocyte, both these enzymes would leak out to the circulatory system thus increasing the concentration levels of SGPT and SGOT. In theory, the destruction of these hepatocyte cells would depend on the virulence of the dengue infection.

The higher the virulence, the worse the hepatocyte cell destruction as a result. This would in turn further increase the concentration levels of SGOT and SGPT within the blood circulation. The dengue infection would reach its peak on the 3rd through 6th days which is called the 'critical phase'. A massive plasma leakage occurs on this phase and one of its clinical manifestations would be damage to the liver. Within this study, some of the examinations of the sample SGOT and SGPT enzyme concentration levels weren't taken during this critical phase but instead during the early stages of the infections or during the convalescence phase. This factor is suspected to be the reason why no correlation was found between the degree of dengue infection with the increase of SGOT and SGPT enzyme levels.

CONCLUSIONS

In this study, no correlation was found between an increase in concentration levels of liver transaminase enzymes (AST and ALT) and the severity of dengue infections in children at Abdul Moeloek General Regional Hospital in 2023. This is suspected to be because of a lack in research samples and the inadequacy of the time in taking of the patients' blood sample. This would hopefully be a reference point for future researchers in conducting future studies with regards to the timing of taking samples.

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