

The Correlation Between Increased Transaminase Levels with Maternal and Neonatal Outcomes in Severe Preeclampsia at Dr. Soetomo General Academic Hospital Surabaya: A Retrospective Analysis Study

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ABSTRACT

Introduction: Preeclampsia is one of the highest causes of maternal mortality in Indonesia. The latest survey data shows Indonesia's Maternal Mortality Rate (MMR) is 305/100,000 live births. The cause of most maternal deaths in Indonesia occurs due to hypertension, preeclampsia, eclampsia, bleeding, and infection. Preeclampsia is a condition that can affect multiple systems of the body. An unusual vascular reaction to the placenta's growth is remarkable, leading to higher levels of systemic vascular resistance. This study aims to determine the correlation between increased transaminase levels with maternal and neonatal outcomes in severe preeclampsia at Dr. Soetomo General Academic Hospital Surabaya. **Methods:** This study is a retrospective analysis study at the Obstetrics and Gynecology department at Dr. Soetomo General Academic Hospital Surabaya from January 2022 - December 2022. The sampling method of this research is by taking laboratory tests of abnormal and normal transaminase levels data before delivery from the medical records of pregnant women with severe preeclampsia. The sample size was determined by total sampling, which resulted in 165 maternal data records. **Results:** A significant correlation was found between increased transaminase levels and maternal mortality. Also, a significant correlation was found between transaminase levels with gestational age and baby birth weight. **Conclusions:** Most patients with severe preeclampsia were found to have normal SGOT and SGPT levels. A significant correlation was found between increased transaminase levels and maternal. A significant correlation was found between increased transaminase levels with gestational age and baby birth weight.

Keywords: severe preeclampsia; increased transaminase; maternal and neonatal outcome.

INTRODUCTION

Preeclampsia is a cause of maternal death that is still high worldwide, especially in Indonesia. The latest survey data shows Indonesia's Maternal Mortality Rate (MMR) is 305/100,000 live births. The cause of most maternal deaths in Indonesia occurs due to hypertension, preeclampsia, eclampsia, bleeding, and infection. Hypertension in pregnancy ranks as the first cause of death in Indonesia at 33% (26). Preeclampsia is a condition that can affect multiple systems of the body. An unusual vascular reaction to the placenta's growth is remarkable, leading to higher levels of systemic vascular resistance (24). Preeclampsia is a leading cause of maternal morbidity. It is associated with adverse fetal outcomes, such as intrauterine growth

restriction, preterm birth, placental abruption, fetal distress, and in-utero fetal mortality. A woman is at higher risk for preeclampsia if she has a history of hypertensive disease during a previous pregnancy or a maternal disease, such as chronic kidney disease, autoimmune diseases, diabetes, or chronic hypertension (10).

Transaminase levels increase due to the disruption of blood flow to the liver caused by elevated blood pressure, which damages liver cells. SGOT and SGPT levels rise as a result of liver cell injury brought on by liver cell disruption. A mother's increased transaminase level causes liver dysfunction and may affect maternal outcomes such as hypertension

during pregnancy, organ dysfunction, and eclampsia. It may also affect the mother's mode of delivery. It can also affect neonatal outcomes, such as preterm birth, newborn obesity, aberrant APGAR scores, and others. This study aims to determine the correlation between increased transaminase levels and maternal and neonatal outcomes in severe preeclampsia at Dr. Soetomo General Academic Hospital Surabaya.

METHODS

This study is a retrospective analysis study at the Obstetrics and Gynecology Department at Dr. Soetomo General Academic Hospital Surabaya from January 2022 - December 2022. The sampling method of this research is by taking laboratory tests

of abnormal and normal transaminase levels data before delivery from the medical records of pregnant women with severe preeclampsia. The sample size was determined by total sampling, which resulted in 165 maternal data records.

RESULTS

From 1 January 2022 to 31 December 2022, 165 severe preeclampsia mothers and 165 babies from medical record data visited Dr. Soetomo General Academic Hospital Surabaya. The total number of patients' data obtained was 217, but 52 patients were excluded because the data was incomplete. Patient data in this study was taken from the medical records of the Obstetrics and Gynecology inpatient Clinic Dr. Soetomo General Academic Hospital Surabaya.

1. The distribution and Frequency Table

TABLE 1: Distribution and frequency of mothers with normal and increased transaminase levels.

		Frequency (%)	
		Normal Transaminase	Increased Transaminase
SGOT / SGPT	5-40 µ/L / 7-56 µ/L	129 (78.2%)	-
	>40 µ/L / >56 µ/L	-	36 (21.8%)
	Total	165 (100%)	

In Table 1, Among the 165 mothers with severe preeclampsia, 129 (78.2%) had normal transaminase levels, ranging between 5 - 40 µ/L (SGOT) and 7 - 56 µ/L (SGPT). 36 (21.8%) mothers with severe preeclampsia had increased transaminase levels.

TABLE 2: Distribution and frequency of age in mothers with normal and increased transaminase levels.

		Frequency (%)		
		Normal Transaminase	Increased Transaminase	Total
Age	≤20	5 (3.9%)	0 (0%)	5 (3%)
	21 - 34	83 (64.3%)	20 (55.6%)	103 (62.4%)
	≥35	41(31.8%)	16 (44.4%)	57 (34.5%)
Total				165 (100%)

In Table 2, most mothers were aged 21-34, both mothers with normal transaminase levels 83 (64.3%) and those with increased transaminase levels 20 (55.6%).

TABLE 3: Distribution and frequency of BMI in mothers with normal and increased transaminase levels.

		Frequency (%)		
		Normal Transaminase	Increased Transaminase	Total
BMI	<25.0 kg/m ²	12 (9.3%)	8 (22.2%)	20 (12.1%)
	25.0-29.9 kg/m ²	47 (36.4%)	9 (25.0%)	56 (33.9%)
	30-34.9 kg/m ²	39 (30.2%)	7 (19.4%)	46 (27.9%)
	35-39.9 kg/m ²	20 (15.5%)	8 (22.2%)	28 (17%)
	≥40 kg/m ²	11 (8.5%)	4 (11.1%)	15 (9.1%)
	<25.0 kg/m ²	12 (9.3%)	8 (22.2%)	20 (12.1%)
	Total			

In Table 3, most mothers in both the normal and increased transaminase level groups had a BMI of 25.0–29.9 kg/m². Specifically, 47 mothers (36.4%) had normal transaminase levels, and 9 mothers (25%) had increased transaminase levels.

TABLE 4: Distribution and frequency of blood pressure in mothers with normal and increased transaminase levels.

		Frequency (%)		
		Normal Transaminase	Increased Transaminase	Total
Blood Pressure	Systolic pressure ≥140 mmHg or diastolic pressure ≥90 mmHg	37 (28.7%)	12 (33.3%)	49 (29.7%)
	Systolic pressure ≥160 mmHg or diastolic pressure ≥ 110 mmHg	92 (71.3%)	24 (66.7%)	116 (70.3%)
		Total		165 (100%)

In Table 4, the majority of mothers experienced hypertension, with a systolic pressure ≥160 mmHg or diastolic pressure ≥110 mmHg. 92 mothers (71.3%) had normal transaminase levels, and 24 mothers (66.7%) had increased transaminase levels.

TABLE 5: Distribution and frequency of gestational age in mothers with normal and increased transaminase levels.

		Frequency (%)		
		Normal Transaminase	Increased Transaminase	Total
Gestational Age	<34 weeks	57 (44.2%)	26 (72.2%)	83 (50.3%)
	34-36 weeks	44 (34.1%)	5 (13.9%)	49 (29.7%)
	>37 weeks	28 (21.7%)	5 (13.9%)	33 (20%)
		Total		165 (100%)

In Table 5, most babies were born before 34 weeks of gestation, 57 (44.2%) in mothers with normal transaminase levels and 26 (72.2%) in mothers with increased transaminase levels.

Maternal Outcome:

TABLE 6: Distribution and frequency of maternal outcome in mothers with normal and increased transaminase levels.

		Frequency (%)		
		Normal Transaminase	Increased Transaminase	Total
Maternal Outcome	Recovered	126 (97.7%)	32 (88.9%)	158 (95.8%)
	Death	3 (2.3%)	4 (11.1%)	7 (4.2%)
		Total		165 (100%)

In Table 6, the mortality rate among mothers with normal transaminase levels was 3 (2.3%), while mothers with increased transaminase levels had 4 (11.1%).

Neonatal Outcome:

TABLE 7A: Distribution and frequency of neonatal status in mothers with normal and increased transaminase levels.

		Frequency (%)		
		Normal Transaminase	Increased Transaminase	Total
Neonatal Status	Alive	105 (81.3%)	24 (66.7%)	129 (78.2%)
	IUFD	10 (7.8%)	7 (19.4%)	17 (10.3%)
	Neonatal Death	14 (10.9%)	5 (13.9%)	19 (11.5%)
		Total		165 (100%)

In Table 7a, 10 (7.8%) of 129 babies were IUFD in mothers with normal transaminase levels, and 7 (19.4%) of 36 babies were IUFD in mothers with increased transaminase levels. 14 (10.9%) of 129 neonates died in mothers with normal transaminase levels, and 5 (13.9%) of 36 neonates died in mothers with increased transaminase levels.

TABLE 7B: Distribution and frequency of the baby's birth weight in mother with normal and increased transaminase levels.

		Frequency (%)		
		Normal Transaminase	Increased Transaminase	Total
Baby Birth Weight	<1.5 kg	35 (27.1%)	15 (41.7%)	50 (30.3%)
	1.5 - 2.4 kg	52 (40.3%)	14 (38.9%)	66 (40%)
	2.5 - 3.4 kg	34 (26.4%)	7 (19.4%)	41 (24.8%)
	3.5 - 4.5 kg	8 (6.2%)	0 (0%)	8 (4.8%)
		Total		165 (100%)

In Table 7b, 52 (40.3%) of 129 babies were born between 1.5 – 2.4 kg in mothers with normal transaminase levels, and 15 (41.7%) of 36 babies were born less than 1.5 kg in mothers with increased transaminase levels.

TABLE 7C: Distribution and frequency of the baby's APGAR score in mothers with normal and increased transaminase levels.

		Frequency (%)		
		Normal Transaminase	Increased Transaminase	Total
APGAR Score	0-3 (Severe Asphyxia)	25 (19.4%)	12 (33.3%)	37 (22.4%)
	4-6 (Moderate Asphyxia)	48 (37.2%)	12 (33.3%)	60 (36.4%)
	7-10 (Mild Asphyxia to normal)	56 (43.4%)	12 (33.3%)	68 (41.2%)
		Total		165 (100%)

In Table 7c, 56 (43.4%) out of 129 babies were born with an APGAR score of 7-10 in mothers with normal transaminase levels. 12 (33.3%) out of 36 babies were born with APGAR scores 0-3, 12 (33.3%) of 36 babies were born with APGAR scores 4-6, and 12 (33.3%) of 36 babies were born with APGAR scores 7-10.

2. The Correlation Test Result Table

TABLE 8: The correlation between transaminase levels with mother’s age.

Transaminase	Age	Frequency (%)	Sig. (2-tailed)
Normal Transaminase	<20	5 (3.9%)	0.096
	21-34	83 (64.3%)	
	≥35	41 (31.8%)	
	Total	129 (100%)	
Increased Transaminase	<20	0 (0%)	
	21-34	20 (55.6%)	
	≥35	16 (44.4%)	
	Total	36 (100%)	

In Table 8, the correlation test between increased transaminase levels and age showed a non-significant result (Sig. (2-tailed) = 0.096).

TABLE 9: The correlation between transaminase levels with mother’s BMI.

Transaminase	BMI (kg/m ²)	Frequency (%)	Sig.(2-tailed)
Normal Transaminase	<25.0	12 (9.3%)	0.908
	25.0-29.9	47 (36.4%)	
	30-34.9	39 (30.2%)	
	35-39.9	20 (15.5%)	
	≥40	11 (8.5%)	
	Total	129(100%)	
Increased Transaminase	<25.0	8 (22.2%)	
	25.0-29.9	9 (25.0%)	
	30-34.9	7 (19.4%)	
	35-39.9	8 (22.2%)	
	≥40	4 (11.1%)	
	Total	36 (100%)	

In Table 9, the correlation test between increased transaminase levels and BMI showed a non-significant result (Sig. (2-tailed) = 0.908).

TABLE 10: The correlation between transaminase levels with maternal outcome.

Transaminase	Maternal Status	Frequency (%)	Sig. (2-tailed)
Normal Transaminase	Recovered	126 (97.7%)	0.021
	Death	3 (2.3%)	
	Total	129 (100%)	
Increased Transaminase	Recovered	32 (88.9%)	
	Death	4 (11.1%)	
	Total	36 (100%)	

In Table 10, the correlation test revealed a significant relationship between transaminase levels and maternal outcomes (Sig. (2-tailed) = 0.021). The maternal mortality rate in mothers with increased transaminase levels was higher compared to those with normal transaminase levels.

TABLE 11: The correlation between transaminase levels with neonatal status.

Transaminase	Neonatal Status	Frequency (%)	Sig. (2-tailed)
Normal Transaminase	Alive	105 (81.3%)	0.108
	IUFD	10 (7.8%)	
	Neonatal Death	14 (10.9%)	
	Total	129 (100%)	
Increased Transaminase	Alive	24 (66.7%)	
	IUFD	7 (19.4%)	
	Neonatal Death	5 (13.9%)	
	Total	36 (100%)	

In Table 11, the correlation test indicated no significant relationship between maternal transaminase levels and neonatal outcomes (Sig. (2-tailed) = 0.108).

TABLE 13: The correlation between transaminase levels with baby birth weight.

Transaminase	Baby Birth Weight	Frequency (%)	Sig. (2-tailed)
Normal Transaminase	<1.5 kg	35 (27.1%)	0.032
	1.5-2.4 kg	52 (40.3%)	
	2.5-3.4 kg	34 (26.4%)	
	3.5-4.5 kg	8 (6.2%)	
	Total	129(100%)	
Increased Transaminase	<1.5 kg	15 (41.7%)	
	1.5-2.4 kg	14 (38.9%)	
	2.5-3.4 kg	7 (19.4%)	
	3.5-4.5 kg	0 (0%)	
	Total	36 (100%)	

In Table 13, the correlation test revealed a significant relationship between maternal transaminase levels and baby birth weight (Sig. (2-tailed) = 0.032). In cases of mothers with increased transaminase levels, 41.7% of babies were born less than 1.5 kg, whereas among mothers with normal transaminase levels, the percentage was 21.7%.

TABLE 14: The correlation between transaminase levels with APGAR score.

Transaminase	APGAR Score	Frequency (%)	Sig.(2-tailed)
Normal Transaminase	0-3 (Severe Asphyxia)	25 (19.4%)	0.101
	4-6 (Moderate Asphyxia)	48 (37.2%)	
	7-10 (Mild Asphyxia to Normal)	56 (43.4%)	
	Total	129 (100%)	
Increased Transaminase	0-3 (Severe Asphyxia)	12 (33.3%)	
	4-6 (Moderate Asphyxia)	12 (33.3%)	
	7-10 (Mild Asphyxia to Normal)	12 (33.3%)	
	Total	36 (100%)	

In Table 14, the correlation test indicated no significant relationship between maternal transaminase levels and APGAR scores (Sig. (2-tailed) = 0.101).

DISCUSSION

1. Increased Transaminase Levels in Severe Preeclampsia

The occurrence of hypertension after 20 weeks of gestation in a pregnant woman may indicate preeclampsia. The risk factors of preeclampsia with severe features are impaired immune system, obesity, diabetes mellitus, chronic hypertension, and others. In severe preeclampsia, maternal transaminase levels can either be normal or elevated. Chronic hypertension can cause the liver's blood vessels to be damaged and become liver dysfunction, and the liver cells are also damaged. Damaged liver cells will elevate the transaminase levels, and the elevation in the mother's transaminase level indicates that liver dysfunction may affect maternal outcomes, neonatal outcomes, and other complications. SGPT (Serum Glutamic-Pyruvic Transaminase) and SGOT (Serum Glutamic-Oxaloacetic Transaminase) are enzymes whose presence and levels in the blood are used as markers for liver function disorders. These enzymes are usually found within liver cells. Damage to the liver causes these enzymes to be released into the bloodstream, thereby increasing their levels in the blood and indicating liver function impairment (32).

2. Maternal Outcome

The diagnosis of liver disease was established based on symptoms, clinical signs, and liver function tests, including measurements of SGOT and SGPT levels. The most frequently occurring diseases associated with liver dysfunction were preeclampsia and eclampsia. A study indicated that liver disease during pregnancy does not pose a significant risk to the mother, and most mothers recover and can take care of their newborns after childbirth. Nevertheless, timely diagnosis, intervention, and monitoring of both the mother and fetus by a collaborative team of obstetricians, neonatologists, gastroenterologists, and anesthesiologists are crucial in preventing and reducing fetomaternal morbidity and mortality (29).

In this study, data from 129 mothers with normal transaminase showed that 126 (97.7%) survived or recovered among mothers with normal transaminase levels, while 3 (2.3%) died. Conversely, among 36 mothers with increased transaminase levels, 32 (88.9%) survived or recovered, and 4 (11.1%) died. The maternal mortality rate in mothers with increased transaminase levels was 8.8% higher compared to those with normal transaminase levels. The correlation test revealed a significant relationship between transaminase levels and maternal outcomes (Sig. (2-tailed) = 0.021). This study concluded that in severe preeclampsia, an elevation in transaminase levels can increase the risk of maternal mortality.

3. Neonatal Outcome

The study by Shekarriz-Foumani et al. (2020) revealed a significantly high percentage of premature births among mothers with liver disease, highlighting the need for accessible medical equipment, such as NICU facilities, for these patients.

In this study, it was found that in mothers with normal transaminase levels, 105 (81.3%) babies survived, 10 (7.8%) babies had IUFD, and 14 (10.9%) neonatal death. In mothers with increased transaminase, 24 (66.7%) babies survived, 7 (19.4%) babies had IUFD, and 5 (13.9%) neonatal death. In this study, maternal transaminase levels do not significantly affect neonatal status. However, this study shows that the highest number of births with a gestational age of less than 34 weeks occurred in severe preeclampsia mothers with increased transaminase levels. Among 129 cases with normal transaminase levels, 57 (44.2%) babies were born before 34 weeks, whereas among 36 cases with increased transaminase levels, 26 (72.2%) babies were born before 34 weeks. In mothers with increased transaminase levels, 41.7% of babies were born less than 1.5 kg, whereas among mothers with normal transaminase levels, the percentage was 27.1%. The correlation test results indicated a significant relationship between maternal transaminase levels and gestational age (Sig. (2-tailed) = 0.015). A significant relationship was found between maternal transaminase levels and baby birth weight (Sig. (2-tailed) = 0.032).

4. The Correlation Between Increased Transaminase Levels with Maternal Outcome in Mother with Severe Preeclampsia at RSUD Dr Soetomo

Several researchers have discussed liver disturbances in pregnant women that do not impact maternal outcomes. This contrasts with the findings of this study, which detected a significant correlation between maternal transaminase levels and maternal outcomes. Based on the data obtained from 129 mothers with normal transaminase, there were 3 (2.3%) cases of maternal death. On the other hand, among 36 mothers with increased transaminase levels, there were 4 (11.1%) cases of maternal death. The output of the Pearson correlation test in Table 10 shows a Sig (2-tailed) of 0.021, indicating a significant relationship between maternal transaminase levels and maternal outcomes. The maternal mortality rate in mothers with increased transaminase levels was 8.8% higher compared to those with normal transaminase levels at Dr. Soetomo General Hospital Surabaya.

The findings of this study differ from those of other researchers. In this study, a significant correlation was found between increased transaminase levels and maternal outcomes. However, Shekarriz-Foumani et al. (2020) did not find a significant correlation between liver disturbances and maternal outcomes, nor did Esposti (2014). The variation in research results may be due to differences in the populations studied and several other factors, such as race, socioeconomic conditions, culture, and geographical conditions, which might influence patient conditions. Additionally, differences may arise because, according to theory, increased transaminase levels indicate the severity of preeclampsia. As preeclampsia is severe, blood flow to the liver may decrease, leading to liver dysfunction and cellular damage.

When preeclampsia is accompanied by abnormalities that exacerbate its severity, it may increase the risk of mortality.

5. The Correlation Between Increased Transaminase Levels with Neonatal Outcome in Mother with Severe Preeclampsia at RSUD Dr Soetomo

Several studies have explained that liver disturbances in pregnant women can impact the baby, leading to outcomes such as preterm birth and common complications like respiratory distress. It is well established that neonatal prematurity leads to incomplete lung maturation and insufficient oxygenation for the body and brain, which can result in developmental delays, a higher risk of mortality, and an increased need for medical support, including NICU care (29).

Data were collected from 129 mothers with normal transaminase levels, there were 10 (7.8%) cases of IUFD and 14 (10.9%) cases of neonatal death. Among 36 mothers with increased transaminase levels, there were 7 (19.4%) cases of IUFD and 5 (13.9%) cases of neonatal death. Nevertheless, neonatal mortality has decreased due to an improved understanding of physiological changes during pregnancy, effective teamwork, and timely interventions (29).

In this study, most babies were born before 34 weeks of gestation, 57 (44.2%) in mothers with normal transaminase levels and 26 (72.2%) in mothers with increased transaminase levels, and there is a significant relationship between maternal transaminase levels and gestational age (Sig. (2-tailed) = 0.015). 129 babies were born within the range of 1.5-2.4 kg in mothers with normal transaminase levels, and 15 (41.7%) of 36 babies were born less than 1.5 kg in mothers with increased transaminase levels. A significant relationship was found between maternal transaminase levels and baby birth weight (Sig. (2-tailed) = 0.032).

In this study, 56 (43.4%) out of 129 babies were born with an APGAR score of 7-10 in mothers with normal transaminase levels. 12 (33.3%) out of 36 babies were born with APGAR scores 0-3, 12 (33.3%) of 36 babies were born with APGAR scores 4-6, and 12 (33.3%) of 36 babies were born with APGAR scores 7-10. No significant relationship between maternal transaminase levels and APGAR scores (Sig. (2-tailed) = 0.101).

Due to the increased incidence of preterm deliveries before 34 weeks in cases of increased transaminase levels in mothers with severe preeclampsia, it is essential to be cautious, especially in mothers with preeclampsia, as this can lead to other complications.

CONCLUSIONS

Based on the data analysis and discussion presented in the previous chapters, the conclusions regarding "The Correlation Between Increased Transaminase Levels with Maternal and Neonatal Outcomes in Severe Preeclampsia at Dr. Soetomo General

Academic Hospital Surabaya", most patients with severe preeclampsia had normal SGOT and SGPT levels. There is a significant correlation between increased transaminase levels and maternal outcomes at Dr. Soetomo General Academic Hospital Surabaya. The maternal mortality rate in mothers with increased transaminase levels was higher compared to those with normal transaminase levels. No significant correlation was found between age and BMI with the mother's transaminase level elevation.

There is a significant correlation between increased transaminase levels and neonatal outcomes at Dr. Soetomo General Academic Hospital Surabaya, specifically the gestational age and baby birth weight. No significant correlation was found between neonatal mortality and APGAR score with the increased transaminase level of the mother.

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