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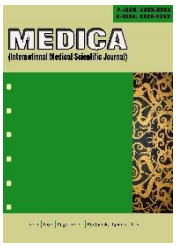

The Relationship Between Hepatitis B Surface Antibody Levels and the Levels of Serum Glutamic Pyruvic Transaminase, Serum Glutamic Oxaloacetic Transaminase, and Total Bilirubin

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Hepatitis B virus is a disease that can impair other functions of the liver. This study aims to determine the relationship between Hepatitis B antibody levels and the levels of SGOT (Serum Glutamic Oxaloacetic Transaminase), SGPT (Serum Glutamic Pyruvic Transaminase), and bilirubin. A quantitative analytic study with a cross-sectional approach was conducted. Data collection involved primary data in the form of hepatitis B serum samples and secondary data including SGOT levels, SGPT levels, bilirubin levels, age, gender, and medical history. The results showed a significant and inverse relationship between Hepatitis B antibody levels and SGOT levels, with a Sig. (2-tailed) value of 0.029 (<0.05) and a negative correlation coefficient of -0.627. Similarly, there was a significant and inverse relationship between Hepatitis B antibody levels and SGPT levels, with a Sig. (2-tailed) value of 0.003 (<0.05) and a negative correlation coefficient of -0.616. However, there was no significant relationship between Hepatitis B antibody levels and bilirubin levels, as indicated by a Sig. (2-tailed) value of 0.809 (>0.05), although the correlation was positive (correlation coefficient = 0.078). In conclusion, Hepatitis B antibody levels show a significant negative correlation with SGOT and SGPT levels, while the correlation with bilirubin levels is positive but not statistically significant.

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1. INTRODUCTION

Hepatitis is an inflammatory condition that affects the liver and is transmitted by the hepatitis virus. This disease can be contracted through contact with contaminated blood or body fluids, contact with sharp objects, or transmission from mother to child (WHO, 2023). Globally, the hepatitis B virus infects around two billion people, with 240 million suffering from chronic hepatitis B. In Indonesia, it is estimated that 28 million people are infected with hepatitis B, of whom 14 million may develop chronic conditions, and 1.4 million are at risk of progressing to liver malignancies (Kementerian Kesehatan Republik Indonesia, 2017). In 2019, hepatitis B virus-related deaths globally were estimated at 820,000, due to both acute infections and chronic outcomes such as liver cirrhosis or liver cancer (WHO, 2023). Of all hepatitis-related deaths, approximately 48% are caused by hepatitis C virus, 47% by hepatitis B virus, and the remaining 5% by hepatitis A and E viruses. Notably, Indonesia is one of the Southeast Asian countries with the highest prevalence of hepatitis B infection (Kementerian Kesehatan Republik Indonesia, 2020). In 2018, the prevalence of hepatitis B cases in Indonesia, based on doctor's diagnoses, was 1,017,290 cases, with Bali Province accounting for 16,481 of these (Badan Penelitian dan Pengembangan Kesehatan, 2019).

HBV transmission can occur both vertically and horizontally. Vertical transmission can occur in infants born to mothers positive for hepatitis B. Horizontal transmission can take place through various entry routes, including contact with skin and mucous membranes, via injections, blood transfusions, surgical instruments, needle-stick injuries, piercings, cuts, as well as oral, nasal, and genital contact (Handojo, 2014). The early phase of HBV infection is characterized by mild, flu-like symptoms including joint pain, weight loss, fever, fatigue, nausea, and vomiting. Although some individuals may feel healthy during this period, they may still experience acute-phase symptoms, including abdominal pain, jaundice, and dark-colored urine (Tong, 2014). A person enters the chronic phase of hepatitis B when the infection persists for more than six months. This limitation is noted since 90–95% of patients become HBsAg-negative during the acute phase.

Hepatitis B leads to additional liver dysfunctions. Liver function can be assessed through liver enzyme analysis. As liver enzymes, aminotransferases are commonly used as specific markers of hepatocyte necrosis. Levels of Serum Glutamic Pyruvic Transaminase (SGPT) and Serum Glutamic Oxaloacetic Transaminase (SGOT) are used to evaluate liver tissue damage caused by hepatitis B (Khairani et al., 2022). Increased levels of SGPT and SGOT are associated with liver parenchyma and serve as more sensitive indicators of liver impairment. These enzymes are found in the liver, and their release into the bloodstream due to liver cell damage causes elevated serum levels (Saulahirwan, et al., 2023). Furthermore, bilirubin examination is necessary to assess liver excretory function, as bilirubin is a breakdown product of heme that is excreted by the liver. Liver damage can lead to abnormal or increased bilirubin levels, resulting in icteric jaundice (Rosida, 2016).

Early diagnosis of hepatitis B can be made through serological testing by analyzing blood samples to detect specific viral antigens, including Hepatitis B Surface Antigen (HBsAg), Hepatitis B Envelope Antigen (HBeAg), and Hepatitis B Core Antigen (HBcAg). Testing for antibodies against specific viral antigens, such as the Hepatitis B surface antibody (anti-HBs), is also essential. Increased titers of HBsAg found in the serum of hepatitis B patients indicate the presence of HBV antibodies in the body (Smalls et al., 2019). Additionally, according Kasih and Hapsari (2017), the presence of Anti-HBs in the blood can result from infection, immunization, or immunoprophylaxis with HBIG. Thus, the

presence of antibodies in the human body implies an immune response to the hepatitis virus in the liver, potentially leading to hepatocyte damage.

The approach to detecting antibodies includes the use of ELFA (Enzyme-Linked Fluorescent Assay). The operational mechanism is similar to ELISA (Enzyme-Linked Immunosorbent Assay), where antigen-antibody complexes conjugated with enzymes are used to detect the presence of antibodies or antigens. However, ELFA uses a fluorogenic substrate. The fluorescence emitted by the antigen-antibody complex is measured using a fluorometer equipped with appropriate excitation and emission filters at specific wavelengths (Kamil et al., 2021). ELFA offers several advantages, including high specificity in distinguishing positive and negative samples, variability in signal strength, high sensitivity, and a negative predictive value above 99%. Furthermore, it differentiates each bound antibody by producing a distinct fluorescence pattern corresponding to specific antigen locations. Meanwhile, the determination of bilirubin, SGOT, and SGPT levels is performed using enzymatic methods and automated clinical chemistry analyzers (Hidayati, 2019).

In 2021, the author conducted a literature review based on research at RSUD Dr. H. Abdul Moeloek. The findings revealed that among 95 patients with hepatitis B, the distribution of SGOT levels within normal limits was 44 individuals (46.3%), while elevated levels were found in 51 individuals (53.7%). For SGPT, 49 individuals (51.6%) were within the normal range, while 46 individuals (48.4%) had elevated levels. The study concluded that SGOT levels increased more significantly than SGPT levels in hepatitis B patients (Alwaali, 2023).

A preliminary study conducted by the author at RSUD Klungkung showed that patients suspected of hepatitis B are tested using a rapid antigen test to confirm HBV positivity. Once confirmed, liver function tests such as SGOT, SGPT, and bilirubin are performed according to the physician’s request to guide treatment.

Hepatitis B virus is a viral infection that affects liver tissue and is classified under the Hepadnaviridae family. Individuals of all ages, races, and genders are susceptible to this condition (Masriadi, 2014). Hepatitis B is a contagious disease caused by the hepatitis B virus (HBV), which is a double-stranded DNA virus with a diameter of 42 nm. HBV is globally transmissible. A quarter of the more than 250 million carriers suffer from chronic active hepatitis. Approximately one million deaths occur annually due to hepatocellular carcinoma and HBV-related liver disease. In addition to presenting acutely or chronically, HBV can cause both asymptomatic and symptomatic infections. HBV transmission can occur parenterally or non-parenterally (Handayani, 2020). Close contact with contaminated objects can also transmit the virus. From an epidemiological perspective, HBV transmission is categorized into two primary modes: vertical and horizontal. This study aims to determine the relationship between hepatitis B antibody levels and serum glutamic pyruvic transaminase, serum glutamic oxaloacetic transaminase, and bilirubin levels.

2. METHOD

This study employed an analytical approach with a cross-sectional design. To assess the correlation between variables, a quantitative method was used, involving data collection at a single point in time. Laboratory results using hepatitis B serum samples were presented in numerical form. These data were then analyzed quantitatively using statistical software.

The sample collection was conducted at Klungkung Regional Public Hospital (RSUD Klungkung), located at Jalan Flamboyan No. 40, Semarapura Kauh, Klungkung. The antibody testing was carried out at the Integrated Immunoserology Laboratory of the

Denpasar Health Polytechnic (Poltekkes Kemenkes Denpasar), located at Jalan Pulau Moyo No. 33A, Pedungan, Denpasar.

The study population consisted of hepatitis B-positive patients at RSUD Klungkung from May to October 2023, totaling 12 patients. Sampling was performed based on specific inclusion and exclusion criteria. The inclusion criteria were patients who tested positive for hepatitis B and had medical records at RSUD Klungkung. The exclusion criteria included patients who did not consent to participate, female patients who were pregnant or breastfeeding, and patients undergoing immunoprophylaxis therapy.

This study used a total sampling technique, where all members of the population (hepatitis B-positive patients) were included as research samples (Sugiyono, 2017). Primary data in this study consisted of results from hepatitis B antibody testing on patient serum samples from RSUD Klungkung. Secondary data included existing information such as medical records documenting SGOT, SGPT, bilirubin levels, age, gender, and medical history of liver disease.

Data collection was conducted by testing the hepatitis B antibody levels through blood samples taken from hepatitis B-positive patients. These samples were centrifuged, and the serum was tested for antibody levels using the ELFA method (Enzyme-Linked Fluorescent Assay) with a VIDAS instrument. Additional data were collected visually from medical records and laboratory results of hepatitis B patients at RSUD Klungkung. Data collection techniques included observation and interviews with clinic and laboratory staff.

The study involved two types of variables: independent and confounding variables. The independent variables were SGOT, SGPT, and total bilirubin levels in relation to hepatitis B antibody levels. The confounding variables were age, gender, and history of liver disease. Data analysis techniques included univariate analysis and bivariate analysis using the Spearman Rank correlation test.

3. RESULTS

Table 1. Characteristics of Hepatitis B Patients

Characteristics	**n**	**(%)**
Age (Years)		
18–25	0	0%
26–35	2	17%
36–45	2	17%
46–55	6	49%
56–60	2	17%
Total	12	100%
Gender		
Male	9	75%
Female	3	25%
Total	12	100%
History of Liver Disease		
Present	1	8%
Not Present	11	92%
Total	12	100%
SGOT Levels (u/L)		
8–37 (Normal)	9	75%
>37 (Elevated)	3	25%
Total	12	100%
SGPT Levels (u/L)		
13–42 (Normal)	10	83%

>42 (Elevated)	2	17%
Total	12	100%
Total Bilirubin (mg/dL)		
0.3–1.2 (Normal)	12	100%
>1.2 (Elevated)	0	0%
Total	12	100%

Table 1 shows that the highest number of respondents in this study were aged 46–55 years, totaling 6 out of 12 individuals (49%). The study also included respondents aged 56–60 years, 36–45 years, and 26–35 years. In terms of gender, the majority of respondents were male, with 9 out of 12 individuals (75%) being male. Only 1 respondent (8%) had a history of liver disease. Regarding laboratory values, the number of respondents with normal levels of SGOT, SGPT, and total bilirubin were 9 (75%), 10 (83%), and 12 (100%) respectively.

Table 2. Measurement Results of Hepatitis B Antibody Levels

Hepatitis B Antibody Level (mIU/mL)	Number of Respondents	Percentage (%)
< 8	5	42%
≥ 8 – 12	3	25%
> 12	4	33%
Total	12	100%

Table 2 shows that the majority of respondents had hepatitis B antibody levels of < 8 mIU/mL, with 5 individuals (42%). Antibody levels < 8 mIU/mL indicate a negative antibody result.

Table 3. Correlation Between Hepatitis B Antibody Levels and SGOT Levels

Antibody Level	SGOT Level
Correlation Coefficient (Spearman's rho)	-0.627*
Sig. (2-tailed)	0.029
N	12

Table 3 shows the results of Spearman’s rho test, with a correlation coefficient of -0.627, indicating a strong negative correlation between hepatitis B antibody levels and SGOT levels. The negative value suggests an inverse relationship—i.e., as antibody levels increase, SGOT levels tend to decrease, and vice versa. The Sig. (2-tailed) value is 0.029, which is < 0.05, indicating a statistically significant correlation.

Table 4. Correlation Between Hepatitis B Antibody Levels and SGPT Levels

Antibody Level	SGPT Level
Correlation Coefficient (Spearman's rho)	-0.616*
Sig. (2-tailed)	0.033
N	12

Table 4 shows the results of Spearman’s rho test, with a correlation coefficient of -0.616, indicating a strong negative correlation between hepatitis B antibody levels and SGPT levels. The negative coefficient implies that an increase in antibody levels is associated with a decrease in SGPT levels. The Sig. (2-tailed) value of 0.033 (< 0.05) indicates a statistically significant relationship between these variables.

Table 5. Correlation Between Hepatitis B Antibody Levels and Total Bilirubin

Antibody Level	Total Bilirubin Level
Correlation Coefficient (Spearman's rho)	0.078
Sig. (2-tailed)	0.809
N	12

Table 5 shows that the Spearman's rho correlation coefficient between hepatitis B antibody levels and total bilirubin is 0.078, indicating a very weak positive correlation. This means that as antibody levels increase, bilirubin levels tend to increase as well, but the relationship is minimal. The Sig. (2-tailed) value is 0.809, which is > 0.05, indicating that the correlation is not statistically significant.

DISCUSSION

Based on Table 1, the majority of respondents in this study were in the 46–55 years age group, comprising 6 out of 12 individuals (49%). Other respondents fell within the age groups of 56–60, 36–45, and 26–35 years. These findings are consistent with previous research (Alwaali), which reported that most hepatitis B-positive patients were aged between 40 and 70 years (87.4% of cases). This age group is considered older and tends to experience declining physiological functions, making them more vulnerable to viral infections. As described by another study Puspita and Kamila, (2017), older adults have a higher risk of impaired liver function and weakened immune responses, increasing their susceptibility to infections.

Regarding gender, the study population was predominantly male, with 9 out of 12 respondents (75%). This may be associated with differences in lifestyle between men and women. Men are more likely to consume alcohol, use drugs, and engage in unhealthy behaviors. Additionally, studies by Geni and Yahya have shown a higher prevalence of hepatitis B among men, potentially linked to risk factors such as non-sterile shaving equipment, alcohol consumption, and high-risk sexual behavior (Geni & Yahya, 2022).

Still based on Table 1, only 1 respondent (8%) had a history of liver disease. Hepatitis B virus (HBV) primarily targets liver cells and can cause damage; however, as stated in previous research (Alwaali, 2023), HBV is non-cytopathic, meaning it does not directly destroy liver cells. Instead, liver damage in hepatitis B is typically caused by the body's immune response to viral replication during either acute or chronic infection phases.

Most respondents had normal liver enzyme levels: SGOT (75%), SGPT (83%), and total bilirubin (100%). Elevated SGOT and SGPT levels may not be solely caused by hepatitis infection but also by factors such as fatty liver, drug-induced hepatitis, autoimmune hepatitis, or alcohol-related liver disease. Increases in these enzymes do not always indicate liver dysfunction, as they may also result from fatigue, intense physical activity, certain medications, or alcohol consumption.

The normal bilirubin levels observed in this study are supported by findings from another study (Abdalah, 2020), which reported no significant association between HBsAg status and liver enzymes, including bilirubin. This suggests that hepatitis B infection does not always directly affect bilirubin levels. According to Abdalah, other markers such as HBeAg and viral DNA are more sensitive indicators of liver damage. However, elevated bilirubin can still reflect hepatic inflammation, biliary obstruction, or hemolysis (Selung et al., 2017).

According to Table 2, 5 respondents (42%) had hepatitis B antibody levels below 8 mIU/mL, which are considered negative. High antibody levels indicate an immune response either due to infection or vaccination. Di Lello stated that positive antibodies may signify the convalescent or recovery phase (Di Lello, et al., 2022). Another study Gunawan

and Herawati (2018) found that 20 of 23 vaccinated children had positive antibody titers. Similarly, Kasih and Hapsari (2017) reported that 41 of 53 vaccinated medical students had antibody levels above 10 mIU/mL. This study also identified respondents with antibody levels ≥ 8 mIU/mL, indicating a positive immune response due to prior infection or vaccination (Jackson et al., 2018).

Table 3 shows a negative correlation between hepatitis B antibody levels and SGOT, with higher antibody levels associated with lower SGOT values. This suggests a complex interaction between the immune response and liver enzyme activity in hepatitis B infection (Badriyya and Srangenge, 2023). Elevated antibodies indicate an effective immune response against the virus, which contributes to a decrease in liver enzyme activity (Tan et al., 2015).

Similarly, Table 4 demonstrates a negative correlation between hepatitis B antibody levels and SGPT. As antibody levels increase, SGPT tends to decrease, indicating an effective immune response in reducing liver damage caused by HBV (Tan et al., 2015). According to another study Sihobing and Gultom, (2016), while decreasing SGPT does not always imply complete recovery, it reflects the immune system's success in controlling the infection.

Liver enzyme tests, including SGOT and SGPT, are performed using patient serum samples. Normally, these enzymes remain within liver cells but are released into the bloodstream when liver damage occurs. A study by Ahdi at RSUD Jombang (2023) found that initial hepatitis B screening is performed using rapid HBsAg tests. Reactive results indicate active infection. However, in this study, SGOT and SGPT levels remained normal despite reactive HBsAg results, suggesting no significant liver damage. These findings are consistent with another study Ahdi (2023), which emphasized the importance of periodic SGOT and SGPT monitoring.

Elevated SGOT and SGPT levels are common indicators of hepatitis, as the liver contains high concentrations of these enzymes. Damage from alcohol, drugs, or viral infection can cause enzyme leakage into the bloodstream (Khumaedi et al., 2016). This is supported by other studies Sridanti, (2019), which found that liver inflammation from hepatitis triggers enzyme release into the blood, increasing measured levels.

Table 5 presents a very weak positive correlation ($r = 0.078$) between hepatitis B antibody levels and total bilirubin. While antibodies indicate an immune response, hepatitis B infection may impact bilirubin metabolism due to impaired liver excretory function (Philips et al., 2021, Corral-Jara et al., 2015). Liver damage can lead to bilirubin accumulation in the blood (hyperbilirubinemia), which causes symptoms such as jaundice (Xie et al., 2023). Du et al., (2016) noted that bilirubin levels increase in hepatitis B patients; however, this finding is inconsistent with studies showing that elevated bilirubin may reduce the risk of cardiovascular disease (Du et al., 2016). The small sample size in this study (12 respondents) limits the generalizability of the findings. Moreover, the lack of baseline data at the time of diagnosis hinders the assessment of infection progression.

4. CONCLUSION

Based on the analysis results, it was found that the majority of respondents were in the 45–55 age group and were male. Most respondents had SGOT, SGPT, and total bilirubin levels within the normal range. A total of 42% of respondents had hepatitis B antibody levels below 8 mIU/mL, indicating a negative result for the antibody. Statistical tests showed a significant negative correlation between hepatitis B antibody levels and SGOT and SGPT levels. This means that an increase in antibody levels tends to be accompanied by a decrease in these liver enzyme levels, which may reflect an effective immune response to infection. On the other hand, no significant relationship was found

between hepatitis B antibody levels and total bilirubin levels. For future research, it is recommended to include other relevant examination parameters such as HBeAg, HBV DNA, as well as a more comprehensive immunological profile and liver function assessment.

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