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ASPARTATE TRANSAMINASE IN CHRONIC HEPATITIS B PATIENTS AT AWALBROS BATA HOSPITAL

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Chronic Hepatitis B
HBV Viral Load
Alanine Transaminase (ALT)
Aspartate Transaminase (AST)
Liver Damage

Penulis Korespondensi

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ABSTRACT

Chronic hepatitis B (HBV) is a liver infection characterized by persistent replication of Hepatitis B virus (HBV). Viral load is a parameter often used to evaluate viral replication activity, while Alanine Transaminase (ALT) and Aspartate Transaminase (AST) often used as biomarkers to assess liver damage. Objective: This study aims to evaluate the correlation of HBV viral load to ALT and AST in patients with chronic hepatitis B at Awalbros Batam Hospital. Methods: This research used descriptive study by data collected from patients with chronic hepatitis B who had undergone testing assessments of HBV viral load, ALT and AST. Results: The results of this study is indicate a significant correlation of HBV viral load to ALT levels. Approximately 40% of patients showed elevated ALT levels in line with increasing HBV load, while AST increase was observed in only about 5% of patients. The stronger correlation was noted in ALT, likely due to its higher specificity to liver tissue compared to AST. Conclusion: Quantitative HBV load significantly influences ALT levels but has a less notable effect on AST levels. These findings support the role of ALT as a more reliable indicator of chronic HBV infection. The study also simplifies the clinical phases of infection into two main categories: active and inactive, based on presumed similarities in clinical patterns.

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INTRODUCTION

Hepatitis B virus infection causes a broad spectrum of liver diseases ranging from acute to chronic hepatitis, cirrhosis, and hepatocellular carcinoma (KHS). The hepatitis B virus is a serious public health problem. WHO (2020) states that around 260 million people in the world have been infected with the hepatitis B virus. According to research by Vachon and Osiowy (2021), around 880,000 deaths per year due to hepatitis B continue to be cirrhosis of hepatitis and hepatocellular carcinoma. The spread of the hepatitis B virus is of particular concern in Indonesia because around 7.1% of Indonesians have been infected with hepatitis B (Febrita, 2022).

Hepatitis B disease in Indonesia occupies the first position with a percentage of 21.8%, then in the second position is occupied by Hepatitis A disease with a percentage of 19.3% and in the third position is occupied by Hepatitis C disease with a percentage of 2.5% (Health Research and Development Agency, 2013). Research that has been conducted at Husada Hospital found that Hepatitis B disease is around 65% in men while in women it is only 35% (Geni & Yahya, 2022). Hepatitis disease is generally characterized by an increase in SGOT and SGPT levels in the blood because the liver is one of the organs of the body that contains a lot of transaminase enzymes. When the liver organ experiences inflammation or necrosis caused by alcohol, drugs and viral infections, the enzymes SGOT and SGPT will be released and enter the blood circulation, causing high levels of the enzymes SGOT and SGPT in the blood. Therefore, SGOT and SGPT are used as one of the indications of hepatitis or liver inflammation (Geni & Yahya, 2022)

Hepatitis B virus DNA (HBV DNA) is the gold standard test to diagnose hepatitis B and its levels are used as a reference to start antiviral therapy in HBK patients. HBV DNA testing can use the nucleic acid amplification method with Polymerase Chain Reaction (PCR). However, PCR tests take a long time and are relatively expensive, because the process requires complex tools, special preparation, and trained personnel, so not all laboratories have them. Serological examination markers (antigen or antibody detection) can be an alternative option that assists clinicians in establishing diagnosis, determining infection phases, monitoring therapy, and determining the prognosis of HBK patients in places with PCR limitations (Hanjoyo et al., 2021)

METHODS

Research types and designs

The type of research conducted is a descriptive study that aims to get an overview of the correlation of hepatitis B virus infection with liver damage biomarkers, namely ALT and AST.

Population

The population in this study is all patients with a diagnosis of Hepatitis B disease who have undergone treatment or just follow-up screening at Awalbros Batam hospital from 2023 to 2024

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Sample

The sample in this study amounted to 20 patients with a diagnosis of hepatitis B who had undergone quantitative HBV tests Gene Expert, ALT and AST at the laboratory of Awal Bros Hospital Batam

Sampling techniques

Sampling is the first step and an important aspect of the entire analysis process. In this study, the sampling technique was carried out randomly, meaning that the unit was selected exclusively based on the availability of units until the number of samples was reached.

DATA ANALYSIS

The frequency distribution table is used to present the data descriptively in this study. The frequency distribution of quantitative HBV levels, ALT and AST levels in patients with a diagnosis of hepatitis B at Batam Awalbros Hospital in 2024 are 3 variables that are the basis for the frequency distribution analysis in this study (Supriadi, 2021).

The results of quantitative HBV, ALT and AST examination of hepatitis B patients can be calculated using the following formula:

RESULTS AND DISCUSSION

HBV DNA Testing Using Gene Expert

1. Patient Preparation:
- No fasting required.
- Inform that the HBV DNA results reflect the current activity of the virus.

2. Sample Taking:
- Sample Type: EDTA Plasma.
- Volume: 1–2 mL of blood, then centrifugated → take 1 mL of plasma.

3. Sample Handling:
- Avoid hemolysis.
- Store plasma at 2–8°C (max. 5 days) or -20°C (if stored longer).
- Avoid repeated freeze-thaw.

4. Equipment & Materials:
- GeneXpert Instrument and supporting computers.
- Cartridge Xpert® HBV Viral Load (Cepheid).

5. Procedure:
1. Turn on the GeneXpert system.
2. Take 1 mL of plasma and pipette directly into the cartridge.
3. Close the cartridge, insert it into the GeneXpert module.
4. Run tests via GeneXpert Dx software.

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5. The system will automatically perform extraction, amplification, and detection (duration ± 90 minutes).
6. The results will appear automatically on the screen (in IU/mL and copy/mL).

6. Verification & Validation:
- Make sure there are no errors in the results (Ct, valid internal controls).
- Results are valid if internal controls and targets are detected according to the curve.

Checking ALT and AST Levels Using the C111 Cobas Tool

1. Patient Preparation:
- Recommended fasting of 8–12 hours.
- Avoid alcohol consumption and strenuous activity 24 hours before blood collection.

2. Sample Taking:
- Jenis sampel: serum (tabung SST/kuning) atau plasma heparin (tabung hijau).
- Volume darah: 2–3 mL.

3. Sample Handling:
- Let freeze 20–30 minutes, then centrifuge 10 minutes (3000 rpm).
- Avoid hemolysis.
- Store at 2–8°C if not analyzed immediately (maximum 48 hours).

4. Equipment & Materials:
- Cobas C111.
- ALT and AST reagents from Roche.
- abnormal).

5. Procedure:
1. Turn on the tool and do daily QC.
2. Insert the ALT/AST reagent into the appropriate position.
3. Put the serum sample in the cup.
4. Run the analysis through the Cobas C111 software.
5. Results are auto-readable and displayed.

6. Verifikasi & Validasi:
- Compare results with reference values.
- Verification of abnormal results.

GENERAL DATA

After conducting research in the laboratory of Awalbros Batam Hospital, data was obtained which was presented in the form of a table as follows :

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Table 4. 1 Data on DNA Levels of ALT, AST, and HBV Patients with Chronic Hepatitis B

No.	Patient's initials	Gender	AST (U/L)	ALT (U/L)	HBVDNA (IU/mL) TERDETEKSI	Status ALT/AST	Suspected Phase Similarities of Chronic Hepatitis B*
1	Y	P	17.8	16.8	9.36 x 10^2 IU/mL (Log 2.97)	Normal	Inactive
2	MAS	L	25.9	43.1	<10 IU/mL (log 1.00)	Increase	Inactive
3	EI	P	24.3	27.4	2.91 X 10^5 (Log 5.46)	Normal	Active
4	ASL	L	15.8	16.9	< 10 IU/mL (Log 1.00)	Normal	Inactive
5	RLL	P	13.5	13	399 IU/mL (Log 2.60)	Normal	Inactive
6	TTL	L	32.8	25.6	8.58 x 10^6 IU/mL (Log 6.93)	Normal	Active
7	PS	L	30.6	64.6	3.44 x 10^2 IU/mL (Log 2.54)	Increase	ALT high, but DNA Low → Inactive*
8	SR	L	25.6	6.96	3.84 x 10^8 IU/mL (Log 8.58)	Normal	Active
9	HP	P	21.3	6.5	9.84 x 10^8 IU/mL (Log 8.99)	Normal	Active
10	CHH	L	24.1	10.4	2.72 x 10^6 IU/mL (Log 6.43)	Normal	Active
11	VZ	P	20.2	16	3.18 x 10^8 IU / mL (Log 8.50)	Normal	Active
12	LY	L	39	79.2	1.78 x 10^4 IU /	Increase	Active

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					mL (Log 4.25)		
13	AWH	P	109.1	88.6	1.13 x 10^2 IU/mL (Log 2.05 Log IU/mL)	Increase	ALT/AST high, DNA Low → Maybe flare / Active
14	DP	L	33	61.8	3.16 x 10^3 IU/mL (Log 3.50 Log IU/mL)	Increase	May be mildly active
15	IE	P	22	52	2.59 x 10^8 IU/mL (Log 8.41 Log IU/mL)	Increase	Active
16	NA	L	29	14	5.1 x 10^1 IU/mL	Normal	Inactive
17	YA	L	23	33	9.89 x 10^4 IU/mL (Log 5.00 Log IU/mL)	Normal	Active
18	R	P	22.3	17.8	3.04 X 10^3 IU/mL (Log 3.48)	Normal	May be mildly active
19	IN	L	20.4	20.7	1.21 x 10^4 IU/ML (Log 4.08)	Normal	May be mildly active
20	EDC	P	12.4	12.8	25 IU/mL (Log 1.40)	Normal	Inactive

*****Note: The grouping into "suspected chronic hepatitis B phase resemblance" in this table is hypothetical and inferential, based on the presence/absence of elevated liver enzyme levels (ALT/AST). The definitive classification of chronic hepatitis B phase requires HBeAg and anti-HBe status data, which are not available in this study.

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SPECIAL DATA

Table 4. 2 Frequency Distribution of AST Levels in Hepatitis B Patients with Undetected Viral Load

No	Interpretation of results	Quantity	Presentase (%)
1	Abnormal	1	5
2	Normal	19	95
	Total	**20**	**100**

Based on table 4.2, it was obtained that one in twenty (5%) hepatitis B patients with a detected viral load experienced an increase in AST and nineteen others (95%) had normal AST levels even though the viral load was still detected

Table 4. 3 Frequency Distribution of ALT Levels in Hepatitis B Patients with Detected Viral Load

No	Interpretation of results	Quantity	Frequency (%)
1	Abnormal	8	40
2	Normal	12	60
	Total	**20**	**100**

Based on table 4.3, it was found that eight out of twenty (40%) hepatitis B patients with a detectable viral load experienced an increase in ALT and the other twelve (60%) had normal ALT levels even though the viral load was still detected

Table 4. 4 Frequency Distribution Based on Suspected Phase Similarity of Chronic Hepatitis B Phases

Alleged similarities in hepatitis phases Chronic B	Number of samples	Frequency (%)
Active	13	65
Inactive	7	35
Total	**20**	**100**

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Based on table 4.4, it can be seen that the active phase and the active phase here refer to the active HBV DNA replication activity detected, it can be seen that 13 out of 20 samples (65%) of infected patients refer to the active phase, and 7 out of 20 samples (35%) of infected patients refer to the inactive phase

DISCUSSION

From the research data that has been collected, in table 4.3 it can be seen that the percentage of ALT levels has increased by 40% and in table 4.2 AST has increased by 5%. This proves that chronic hepatitis B patients generally have higher ALT values because ALT (Alanine Aminotransferase) is an enzyme that is widely produced in liver cells. This shows that ALT is an effective parameter for diagnosing hepatocellular destruction. The liver is the only cell that has a high concentration of SGPT. Therefore, ALT has a high specificity for liver damage. In the event of liver cell damage, the ALT enzyme will exit a lot of the extra space of the cell and into the bloodstream. (Setiawati et al., 2021)

There is a significant correlation between HBV load and ALT levels in patients with Hepatitis B infection<. Increased ALT is more correlated to inflammatory processes than fibrosis (Marzinke, 2020)

The relationship between HBV load and AST levels in describing the degree of liver damage in patients infected with Hepatitis B is significant but not specific, due to the fact that AST production spreads in several organs and tissues, according to research (Zulfa Nadiroh, Rangga Pragasta, 2024) suggests that AST enzyme levels can increase in peripheral circulation, when infection occurs in a tissue, However, it is considered less specific to liver damage.

Aminotransferase levels are not constant during the period of chronic hepatitis B. A single examination of ALT and AST cannot indicate the stage of the disease. The concentration of ALT is higher than that of AST. However, with the development of the disease into cirrhosis, the AST/ALT concentration ratio can be reversed (Febrita, 2022).

The active phase and the inactive phase in this study refer to 4 phases, namely the immunotolerant phase, the active immune phase, the inactive phase, and the reactivation phase. Febrita (2022) confirmed that the bottom 4 phases have special markers and not all phases will be passed by people with hepatitis, where the immune tolerant phase is characterized by HBeAG positive, high serum HBV DNA levels (10^6 – 10^12 IU/mL) and normal ALT counts, the immune clearance phase or active immune phase is characterized by HBeAg Positive, HBV DNA and aminotransferase that fluctuates, the inactive phase is characterized by HBeAg negative, anti-HBe positive, low or undetectable HBV DNA load (<200 IU/mL) and aminotransferase levels that return to normal and the last is the reactivation phase which is characterized by HbeAg negative, anti-Hbe positive and aminotransferase which is sometimes normal and sometimes fluctuates, this phase is often also described as the chronic hepatitis B phase HBeAg negative.

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The role of HBeAg and Anti-Hbe in this study is very important because HBeAg is an envelope that is detected after HBsAg is detected in serum, while Anti-Hbe detected shows low viral replication and low infection rate (Febrita, 2022).

CONCLUSION

From the research that has been carried out, it can be concluded that:

1. HBV DNA testing has been successfully carried out using the Gene Expert tool with the RT-Qpcr method
2. There is a significant correlation between HBV load and ALT levels in patients with hepatitis infection seen from research data that experienced an increase in ALT by 40% and in AST by 5%. a more pronounced correlation is seen in ALT because ALT is produced more in the liver than in AST itself
3. ALT and AST levels have been successfully obtained using the Cobas C111 tool with the Enzymatic Photometry method
4. The increase in quantitative HBV load affects ALT levels but is not so significant to AST, so it can be grouped into several phases, but in the study it is simplified into active phase and inactive phase based on alleged phase similarity.

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