Jurnal Ilmu dan Teknologi Kesehatan
Vol 9, No 2, March 2022
ISSN: 2338-9095 (Print)
ISSN: 2338-9109 (online)

Differences of SGOT-SGPT Levels in Serum and EDTA Plasma in Hepatitis B Patients

Nanda Rizki Khairani, Muhammad Rizki Kurniawan*, Almatin Puspa Dewi
Medical Laboratory Technology Department Universitas Binawan Jakarta, Indonesia
**Email: kurniawan@binawan.ac.id*

Article history

Posted, Nov 20th, 2021
Reviewed, Jan 12th, 2022
Received, Mar 10th, 2022

ABSTRACT

Hepatitis is a disorder in liver inflammation that can be caused by infection with parasites, protozoa, bacteria, viruses, metabolic disorders, drugs, and alcohol that causes damage to human liver cells and can attack all ages, genders, and races throughout the world. Serum Glutamic Oxaloacetic Transaminase (SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT) levels in EDTA plasma can tend to increase more than serum. It is because EDTA plasma contains coagulation factors that can interfere with examining SGOT and SGPT levels on the device. In contrast, serum consists of proteins, electrolytes, antibodies, antigens, and hormones that do not contain coagulation factors. This study aims to compare SGOT and SGPT levels on serum and EDTA plasma samples in Hepatitis B patients. This type of research is an experimental study. This research was conducted on 35 hepatitis B specimens and then tested using the enzymatic method with Humastar 100 (spectrophotometry). Abnormal SGOT levels (>27 U/L) were 54.3% in serum and 51.4% in plasma EDTA. Abnormal SGPT levels (>34 U/L) were 22.9% in serum and 25.7% in plasma EDTA, so there is an insignificant difference in SGOT and SGPT levels in EDTA serum and plasma samples.

Keywords: *EDTA Plasma; Hepatitis B; Serum; Serum Glutamic Oxaloacetic Transaminase-SGOT; Serum Glutamic Pyruvic Transaminase-SGPT*

ABSTRAK

Penyakit hepatitis merupakan suatu kelainan berupa peradangan hati yang dapat disebabkan oleh infeksi parasit, protozoa, bakteri, virus, gangguan metabolisme, obat – obatan, dan alkohol yang menyebabkan kerusakan pada sel hati manusia serta dapat menyerang semua umur, gender, dan ras di seluruh dunia. Kadar Serum Glutamic Oxaloacetic Transaminase (SGOT) maupun Serum Glutamic Pyruvic Transaminase (SGPT) pada plasma EDTA dapat cenderung lebih meningkat dibandingkan serum, hal ini dikarenakan dalam plasma EDTA terkandung faktor koagulasi yang dapat mengganggu pemeriksaan kadar SGOT dan SGPT pada alat, sedangkan serum terdiri protein, elektrolit, antibodi, antigen, dan hormon yang tidak mengandung faktor koagulasi. Penelitian ini bertujuan untuk mengetahui perbandingan nilai SGOT dan SGPT sampel serum dan plasma EDTA pada pasien Hepatitis B. Jenis penelitian ini merupakan penelitian experimental. Penelitian ini dilakukan terhadap 35 spesimen Hepatitis B dan kemudian dilakukan pengujian menggunakan metode

DOI: 10.32668/jitek.v9i2.759

enzimatik dengan alat Humastar 100 (spektrofotometri). Didapatkan hasil SGOT abnormal (>27 U/L) sebanyak 54,3% pada serum dan 51,4% pada plasma EDTA. Hasil SGPT abnormal (>34 U/L) sebanyak 22,9% pada serum dan 25,7% pada plasma EDTA. Sehingga terdapat perbedaan nilai yang tidak signifikan terhadap kadar SGOT dan kadar SGPT pada sampel serum maupun plasma EDTA.
Kata Kunci: plasma EDTA; Hepatitis B; Serum; Serum Glutamic Oxaloacetic Transaminase-SGOT; Serum Glutamic Pyruvic Transaminase-SGPT

INTRODUCTION

Hepatitis is an inflammation or infection of liver cells generally caused by a viral infection. There are five main hepatitis viruses, namely Hepatitis A Virus (HAV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Hepatitis D Virus (HDV), and Hepatitis E Virus (HEV). Hepatitis is a diffuse inflammatory process in tissues caused by viral infections and toxic reactions to drugs and chemicals. This disease can affect all ages, genders, and races worldwide. As many as 1.5 million people in the world died from hepatitis. Hepatitis is a public health problem in developing countries globally, including Indonesia (Kementerian Kesehatan RI, 2014).

The hepatitis B virus causes a chronic infection that affects about 400 million people worldwide. The results of the Basic Health Research (Badan Penelitian dan Pengembangan Kesehatan, 2013) show that the prevalence of the disease is increasing in the population aged over 15 years. The type of hepatitis that infects many Indonesians is hepatitis B (21.8%). The results of hepatitis B treatment have not yet been optimal, resulting in some cases of hepatitis B progressing to cirrhosis of the liver and liver cancer. However, most cases of hepatitis B will recover. In a previous study conducted by Nispahayati, Agrijanti and Getas (2019), it was found that the SGOT and SGPT values increased in serum samples. Whereas in a previous study conducted by Rizky and Wulan (2019), it was found that there was an insignificant difference in the ratio of serum and plasma EDTA.

Liver function tests are needed to assist in the doctor's diagnosis of patients, especially patients with impaired liver function. The liver function tests required include a specific examination of liver parenchymal inflammation, namely, Serum Glutamic Oxaloacetic Transaminase (SGOT) or Aspartate aminotransferase (AST) and Serum Glutamic Pyruvic Transaminase (SGPT) or Alanine aminotransferase (ALT) aiming to determine inflammation that occurs in the

DOI: 10.32668/jitek.v9i2.759

liver (Patel *et al.*, 2017). It is usually an indication of a disorder (inflammation) in the liver (Collinson and Gaze, 2007). SGOT and SGPT enzymes are associated with liver parenchyma cells. The difference is that SGPT is found more in the liver (clinically low concentrations are neglected and are found in the kidneys, heart, and skeletal muscle). In contrast, SGOT is found in the liver, heart (heart muscle), skeletal muscles, kidneys, brain, and blood cells. SGPT is a more specific indicator of liver inflammation than SGOT. SGOT can be elevated in diseases that can affect other organs, such as myocardial infarction, acute pancreatitis, acute hemolytic anemia, severe burns, acute kidney disease, musculoskeletal disease, and trauma (Suburban, 2019).

METHOD

This research method uses experimental research. The research design used was a true experimental design by looking at the dependent and independent variables to compare the values of SGOT and SGPT with serum and plasma samples of EDTA in Hepatitis B patients. Samples were taken using a collection technique adjusted based on the inclusion and exclusion criteria. The sample used in this study is primary data from the total number of Hepatitis B patients who underwent SGOT and SGPT examinations in April - June 2021 at Muhammadiyah Taman Puring Hospital. The data analysis technique for comparing SGOT and SGPT uses plasma samples of EDTA and serum in hepatitis B patients, as many as 35 samples which are then carried out using the Enzymatic method. Experimental tests will be carried out using graphs and data analyzed with Microsoft Excel. The data processed included gender, age, and the results of the comparison of SGOT and SGPT values with EDTA serum and plasma samples in Hepatitis B patients at Muhammadiyah Hospital Taman Puring. This research has passed the ethical test at Budhi Asih Hospital Jakarta with the Ethical Clearance number No: 308/KEP-ETIK/VI/2021.

RESULTS AND DISCUSSION

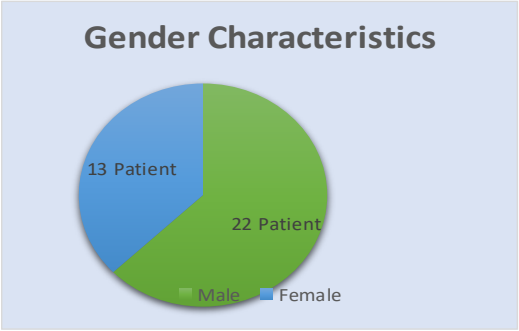

Figure 1. Distribution of the number of Hepatitis B patients

Based on Figure 1, the number of Hepatitis B patients at the Muhammadiyah Taman Puring Hospital shows the gender characteristics. There are 22 male data, while the female data are 13 patients.

DOI: 10.32668/jitek.v9i2.759

Setiawan's (2020) research show that the number of men who have hepatitis is more than women. The results of the Basic Health Research (Badan Penelitian dan Pengembangan Kesehatan, 2013) show that the prevalence of hepatitis B is increasing in males (1.3 %) than women (1.1%).

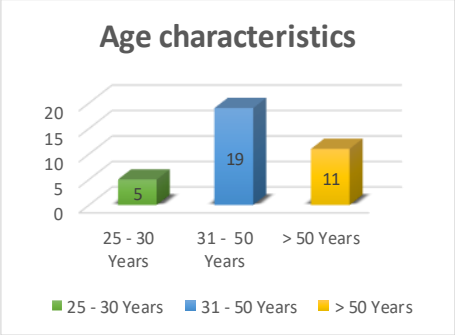

Figure 2. Age Distribution

Based on Figure 2, the age characteristics of hepatitis B patients at Taman Puring Muhammadiyah Hospital obtained data for the 25–30-year age group totaling five people, the 31–50-year age group totaling 19 people, and the >50-year age group totaling 11 people. The results of the Basic Health Research (Badan Penelitian dan Pengembangan Kesehatan, 2013) show that the prevalence of hepatitis B is increasing in the population aged over 15 years. The type of hepatitis that primarily infects the Indonesian population is hepatitis B (21.8%).

Table 1. SGOT and SGPT Levels on EDTA plasma samples

Age	SGOT Levels				SGPT Levels			
	< 27 U/L		> 27 U/L		< 34 U/L		> 34 U/L	
	n	%	n	%	n	%	n	%
25 - 30	3	8.6	1	2.9	3	8.6	1	2.9
31 - 50	11	31.3	9	25.7	14	40	6	17.1
> 50	3	8.6	8	22.9	9	25.7	2	5.7
Total	17	48.6	18	51.4	26	74.3	9	25.7

Based on table 1, the abnormal SGOT values (>27 U/L) in the EDTA plasma sample, 25.7% in the 31–50-year age category. The number of abnormal SGOT values is more significant (51.4%) than normal (48.6%). The abnormal SGPT values (>34 U/L) in EDTA plasma samples were 17.1% in the 31–50-year age category. The number of abnormal SGPT values is smaller (25.7%) than normal (48.6%). Ghorbani *et al.* (2019) study showed that patients with chronic HBV infection significantly increased associated with liver enzymes (SGPT, SGOT).

DOI: 10.32668/jitek.v9i2.759

Table 2. SGOT and SGPT Levels on serum samples

Age	SGOT Levels				SGPT Levels			
	< 27 U/L		> 27 U/L		< 34 U/L		> 34 U/L	
	n	%	n	%	n	%	n	%
25 - 30	3	8.6	1	2.9	3	8.6	1	2.9
31 - 50	10	28.6	10	28.6	14	40	6	17.1
> 50	3	8.6	8	22.9	20	28.6	1	2.9
Total	16	45.7	19	54.3	27	77.1	9	22.9

Based on table 2, the abnormal SGOT values (>27 U/L) in the EDTA plasma sample, 28.6% in the 31–50-year age category. The number of abnormal SGOT values is more significant (54.3%) than normal (45.7%). The abnormal SGPT values (>34 U/L) in EDTA plasma samples were 17.1% in the 31–50-year age category. The number of abnormal SGPT values is smaller (22.9%) than normal (77.1%). In research conducted by Fanani (2018) from 140 samples analyzed, high SGOT and SGPT were found, which were 84.9% and 100%, respectively. However, this research finds that not all hepatitis B patients have elevated SGPT. Maybe it is caused by different conditions of patients. The SGOT, SGPT, and albumin levels between uncomplicated chronic hepatitis B patients and chronic hepatitis B patients with hepatocellular carcinoma also have differences (Maulidia, 2019).

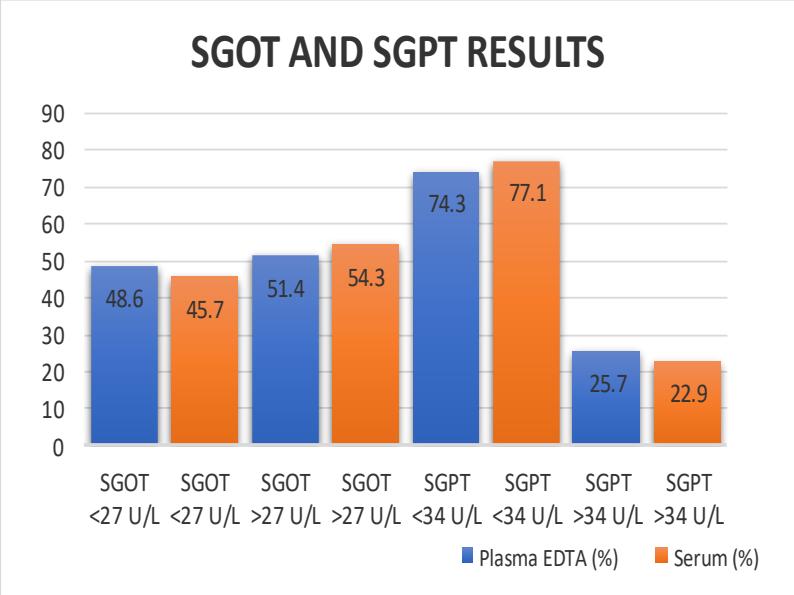

Figure 3. SGOT and SGPT levels on EDTA serum and plasma samples

DOI: 10.32668/jitek.v9i2.759

Figure 3 shows that the SGOT and SGPT examination of EDTA plasma samples with serum have different results but are not significant. The category of normal SGOT values (<27 U/L) in EDTA plasma samples amounting to 48.6% tended to increase more than normal SGOT values (<27 U/L) in serum samples which amounted to 45.7%. The category of abnormal SGOT values (>27 U/L) in EDTA plasma samples was 51.4% lower than the abnormal SGOT values (>27 U/L) in 54.3% of serum samples. Meanwhile, the normal SGPT value category (<34 U/L) in the 74.3% EDTA plasma sample tends to be lower than the normal SGPT value (<34 U/L) in the 77.1% serum sample. Moreover, the category of abnormal SGPT values (>34 U/L) in EDTA plasma samples amounted to 25.7%, an increase compared to abnormal SGPT values (>34 U/L) in serum samples which amounted to 22.9%.

With the increase in the value of SGOT and SGPT with serum and plasma samples of EDTA in hepatitis B patients, there is an insignificant difference in values (Parvez *et al.,* 2019). In a previous study conducted by Nispahayati, Agrijanti and Getas (2019), it was found that the SGOT and SGPT values increased in serum samples. Based on the results of these studies, what the authors get are results that are not in line with previous research. Whereas in a previous study conducted by Rizky and Wulan (2019), it was found that there were differences in the values of SGOT and SGPT in the comparison of serum and plasma EDTA. Using EDTA as an anticoagulant caused a significant difference in the concentrations of aspartate aminotransferase (AST)/SGOT in plasma compared with serum. AST activity was significantly lower in citrated plasma than in that serum (Mohri and Rezapoor, 2009).

Our study shows that reproducibility was good in both plasma and serum. Examining SGOT levels and SGPT levels using serum samples is recommended for consistent and valid results. Using EDTA plasma samples is not recommended in this study because the results are inconsistent. EDTA anticoagulants can affect the results because serum without using anticoagulants so that the components in the serum are not disturbed by activity and the reaction. The content in serum is antigens, antibodies, hormones, and 6-8% of the proteins that make up blood (AbdelAziz *et al.*, 2018). Based on previous studies conducted, there were differences in the value of SGOT and SGPT levels using EDTA serum and

DOI: 10.32668/jitek.v9i2.759

plasma samples. It is recommended to use a more accurate and stable serum sample (Panjaitan *et al.*, 2021). Serum demonstrated higher sensitivity in biomarker detection. The higher metabolite concentrations in serum than in plasma might lead to this advantage. Metabolite measurements in both matrices are subject to a certain background noise level, which might affect measurement accuracy, especially for metabolites with low concentrations. Thus, plasma is more prone to this effect than serum, where metabolite concentrations are generally higher. It was also proposed that the lower protein content in serum might benefit small-molecule analyses and improve overall sensitivity (Yu *et al.*, 2011).

CONCLUSION

The values were not significantly different for SGOT and SGPT levels with serum and plasma EDTA samples. Serum samples are recommended because they are more stable and valid. In contrast, the use of EDTA samples is inconsistent, and anticoagulants can affect the examination results. Accordingly, future studies have yet to determine whether similar observations can be made for other metabolites.

ACKNOWLEDGMENT

The authors would like to thank the Muhammadiyah Taman Puring Hospital for allowing this research in the hospital laboratory.

REFERENCES

AbdelAziz, A. *et al.* (2018) 'Molecular Evaluation of Midikine (Mdk) As A Potential Biomarker Todetect Hepatocellular Carcinoma', *Research Journal of Applied Biotechnology*, 4(1), pp. 66–76. doi: https://dx.doi.org/10.21608/rjab.2018.57518.

Badan Penelitian dan Pengembangan Kesehatan (2013) *Riset kesehatan dasar 2013*. Jakarta. Available at: http://labdata.litbang.kemkes.go.id/images/download/laporan/RKD/2013/Laporan_riskesdas_2013_final.pdf.

Collinson, P. O. and Gaze, D. C. (2007) 'Biomarkers of cardiovascular damage and dysfunction—an overview', *Heart, Lung and Circulation*, 16(3), pp. S71–S82. doi: https://doi.org/10.1016/j.hlc.2007.05.006.

Fanani, D. N. (2018) *Gambaran Enzim Sgot Dan Sgpt Pada Pasien Hepatitis B Di Laboratorium Klinika Surabaya Periode 2017*. Universitas Airlangga. Available at: https://repository.unair.ac.id/79136/.

Ghorbani, P. *et al.* (2019) 'Upregulation of single nucleotide polymorphism of PD-1 gene (rs10204525) in chronic hepatitis B patients', *Int. Arch. Med. Microbiol*, 2(1), pp. 1–8. doi: https://doi.org/10.23937/2643-4008/1710009.

Kementerian Kesehatan RI (2014) 'Situasi dan analisis hepatitis'. Jakarta: Pusat Data dan Informasi Kementerian Kesehatan RI. Available at: https://pusdatin.kemkes.go.id/download.php?file=download/pusdatin/infodatin/infodatin-hepatitis.pdf.

Maulidia, V. N. R. (2019) *Kadar Sgot, Sgpt, Dan Albumin Pada Pasien Dengan Hepatitis B Kronis Di Rsud Dr. Soetomo Surabaya (Penelitian Analitik Cross-Sectional)*. Universitas Airlangga. Available at: https://repository.unair.ac.id/93561/.

Mohri, M. and Rezapoor, H. (2009) 'Effects of heparin, citrate, and EDTA on plasma biochemistry of sheep: comparison with serum', *Research in Veterinary Science*, 86(1), pp. 111–114. doi: https://doi.org/10.1016/j.rvsc.2008.05.010.

Nispahayati, N., Agrijanti, A. and Getas, I. W. (2019) 'Hasil Pemeriksaan Serum Glutamik Oksaloasetik Transaminase (Sgot) Dan Serum Glutamik Pyruvik Transaminase (Sgpt) Pada Pasien Dengan Hasil Hbsag Positif Di Rsud Praya', *Jurnal Analis Medika Biosains (JAMBS)*, 5(1), pp. 21–24. doi: https://doi.org/10.32807/jambs.v5i1.99.

Panjaitan, T. M. *et al.* (2021) 'The Hepatoprotective Effect of White Turmeric Ethanol Extract on Cyclophosphamide-Induced Male Wistar Rats', in *2021 IEEE International Conference on Health, Instrumentation & Measurement, and Natural Sciences (InHeNce)*. IEEE, pp. 1–5. doi: https://doi.org/10.1109/InHeNce52833.2021.9537254.

Parvez, M. K. *et al.* (2019) 'The in vitro and in vivo anti-hepatotoxic, anti-hepatitis B virus and hepatic CYP450 modulating potential of Cyperus rotundus', *Saudi Pharmaceutical Journal*, 27(4), pp. 558–564. doi: https://doi.org/10.1016/j.jsps.2019.02.003.

Patel, J. B. *et al.* (2017) *Performance standards for antimicrobial susceptibility testing*. 29th edn. Pennsylvania: Clinical and laboratory standards institute. Available at: https://clsi.org/media/2663/m100ed29_sample.pdf.

Rizky, V. and Wulan, W. S. (2019) 'Pengaruh Waktu Penanganan Pemeriksaan Terhadap Kadar SGPT pada Serum dan Plasma EDTA', *Analis Kesehatan Sains*, 8(2), pp. 777–781. Available at: http://journal.poltekkesdepkes-sby.ac.id/index.php/ANKES/article/view/1212.

Setiawan, M. (2020) *Angka Kejadian Hepatitis pada Pasien yang Menjalani Hemodialisa di RS. Dr. Wahidin Sudirohusodo Periode Januari-Juni 2019*. Universitas Hasanuddin. Available at: http://repository.unhas.ac.id/id/eprint/1650/.

Suburban, L. (2019) *Cirrhosis is a chronic*. Naperville: Gastroenterology, Ltd. Available at: https://www.sgihealth.com/patients/digestive-health-library/cirrhosis/.

Yu, Z. *et al.* (2011) 'Differences between human plasma and serum metabolite profiles', *PloS one*, 6(7), p. e21230. doi: https://doi.org/10.1371/journal.pone.0021230.