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Research Article

Cat's Liver Disease Detection with SGOT and SGPT Evaluation as a Gold Standard Diagnosis

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ABSTRACT

SGOT and SGPT are two enzymes found in the liver in large amounts. Therefore, elevated levels of these two enzymes in the blood indicate liver disease. This study aims to identify liver disease in cats in Surabaya through the levels of SGOT and SGPT in the blood as the gold standard of diagnosis. Samples came from stray cats and domesticated cats of random age, breed, and sex. The blood samples collected were 62 samples, consisting of 33 domestic cats and 29 samples from stray cats. This study showed that from 33 samples of domesticated cats, 19 samples had higher than normal levels of SGOT, and from 29 samples of stray cats, 27 samples had higher than normal levels of SGOT. For SGPT levels, from 33 samples of domesticated cats, six samples had higher than normal levels of SGPT, and from 29 samples of stray cats, six samples had higher levels of SGPT than average. Data analysis used an independent sample t-test with SPSS for Windows with a significance level of 0.05. The data analysis results showed no significant difference, which means that the high levels of cat SGOT and SGPT enzymes did not significantly affect the origin of the cat. Therefore, it can be concluded that high levels of SGOT and SGPT as the gold standard for detecting liver diseases can occur in all cats, including stray cats and domesticated cats.

Keywords: *SGOT, SGPT, blood chemistry, liver disease, cats*

ABSTRAK

SGOT dan SGPT merupakan 2 enzim yang ditemukan pada organ liver dalam jumlah besar. Peningkatan kadar kedua enzim tersebut dalam darah, merupakan salah satu indikasi adanya penyakit pada liver. Penititian ini bertujuan untuk mengidentifikasi adanya penyakit liver pada kucing-kucing di Surabaya melalui kadar SGOT dan SGPT dalam darah sebagai gold standar diagnosis. Sampel berasal dari kucing liar dan kucing peliharaan dengan umur, breed, dan jenis kelamin acak. Koleksi sampel darah yang didapatkan sebanyak 62 sampel, terdiri dari 33 sampel berasal dari kucing peliharaan, dan 29 sampel berasal dari kucing liar. Hasil penelitian ini menunjukkan bahwa dari 33 sampel kucing peliharaan terdapat 19 sampel yang mempunyai kadar SGOT lebih tinggi dari normalnya dan dari 29 sampel kucing liar terdapat 27 sampel yang mempunyai kadar SGOT lebih tinggi dari normalnya. Untuk kadar SGPT, dari 33 sampel kucing peliharaan terdapat 6 sampel yang mempunyai kadar SGPT lebih tinggi dari normalnya dan dari 29 sampel kucing liar terdapat 6 sampel yang mempunyai kadar SGPT lebih tinggi dari normalnya. Analisis data menggunakan independent sample t-test dengan SPSS for Windows dengan taraf signifikasi 0,05. Hasil analisis data menunjukkan bahwa tidak terdapat perbedaan yang nyata yang artinya tingginya kadar enzim SGOT dan SGPT kucing tidak berpengaruh nyata terhadap asal usul kucing. Dapat disimpulkan bahwa kadar SGOT dan SGPT yang tinggi sebagai gold standar untuk mendeteksi penyakit liver dapat terjadi pada semua kucing, termasuk kucing liar dan kucing domestik.

Kata kunci: *SGOT, SGPT, kimia darah, penyakit liver, kucing*

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INTRODUCTION

The liver is the largest organ in the body.[1] Two enzymes synthesized in the liver and found in large amounts are SGOT (Serum Glutamic Oxaloacetic Transaminase) and SGPT (Serum Glutamic Pyruvic Transaminase). SGOT is an enzyme found in the cytosol of liver hepatocytes, but it is also present in the heart, skeletal muscle, kidneys and brain. Therefore, the examination of SGOT levels is a biochemical marker to determine the process of necrosis that occurs in the liver. SGPT is an enzyme whose direct synthesis is in liver tissue with the highest activity in the cytosol and mitochondria of hepatocytes. This enzyme is also found in skeletal muscle and cardiac cells, albeit in low concentrations.[2] Liver damage can cause SGOT and SGPT to leak into the bloodstream.[3] Thus, SGOT and SGPT can be better indicators than others to detect liver damage because these two enzymes will increase first, and the increase is more significant when compared to other enzymes.

In general, cats' lives are divided into two, that is, cats living by being kept by the community and cats living stray. Stray cats are cats whose breeding is not controlled, the population continues to increase, there are no owners, and they live roaming and foraging in public places that provide food.[4] Cats are included among crepuscular mammals that have been associated with humans for more than 9,500 years.[5] Like humans, the cat's body, is also composed of several systems to live everyday life, including the digestive system, musculoskeletal, nervous, endocrine, respiratory system, integumentary system, reproduction, secretory and urinary system, immune system, and circulatory system. Six organs work well to carry out the functions of the system type as well. One of the most important organs is the liver. The liver is a central organ because of its essential function, such as playing a role in regulating and regulating metabolism, hormone and protein synthesis, and influencing the immune response and clearing toxins from the bloodstream. A problem that affects liver function is liver disease.[7] The liver, with a similar role, also synthesizes the enzymes SGOT and SGPT. Thus, both stray cats and domesticated cats can be affected by liver disease. SGOT and SGPT are considered the most effective because these enzymes will increase first and more drastically when compared to other enzymes if the liver is damaged.[8]

A comparison is needed whether a cat that is properly cared for with a regular life, which we call a domesticated cat, will be at lower risk of liver disease than stray cats. So, this study aims to determine the levels of SGOT and SGPT obtained from cat blood samples from stray cats and domesticated cats in Surabaya through a blood chemistry laboratory examination. In addition, these results obtained evaluation materials to compare SGOT and SGPT values from the two, which are then used as a standard gold diagnosis for liver disease in cats.

MATERIALS AND METHODS

Materials

Cat blood samples randomly selected were obtained from two different environments, a total 33 samples from domesticated cats with pet owners living in Surabaya and 29 samples from stray cats from four different markets, namely: Pacar Keling Market, Pucang Market, Wonokromo Market and Keputran Market. A sampling of domesticated cat blood was carried out at the Physiological Laboratory of the Faculty of Veterinary Medicine, Wijaya Kusuma University, but for stray cat blood samples, it was directly carried out on the spot at the markets. Pacar Medical Laboratory Surabaya is a place to check the levels of SGOT and SGPT samples. All the research procedures were conducted from January to February 2021.

Methods

a. Sample Collection

The sample was used for a blood chemistry test to determine cat SGOT and SGPT levels in cat blood serum. Blood was taken as much as 1-3 cc using an IV catheter or a 3cc syringe at the location of the anterior antebrachial cephalic vein, saphenous vein, or jugular vein. The blood taken was accommodated in a plain tube (non-EDTA) so that serum was obtained.

b. Laboratory Test

The tube containing the serum sample was then labelled and stored in a styrofoam box with icebox gel and then sent to the Pacar Medical Laboratory Surabaya for SGOT and SGPT examination.

c. Data Analysis

The results of the data obtained were then tabulated, and compared with the reference values of normal cat SGOT and SGPT, so that data were obtained for cats that experienced an increase in SGOT and SGPT both in stray cats and in domesticated cats. Then it continued with the independent t-test with the SPSS program.[9]

RESULTS AND DISCUSSION

The following are the levels of SGOT and SGPT from the results of laboratory examinations of domesticated cats and stray cats shown in Table 1.

Table 1. SGOT and SGPT Levels in Domesticated Cats

NO	DATE	CAT'S NAME	SGOT (U/L)	DES	SGPT (U/L)	DES
1	13/1/21	K.YUKA	141	H	422	H
2	13/1/21	K.CIKI	38	H	111	
3	13/1/21	K.NINIS	52	H	136	H
4	13/1/21	K.UPRID	32		110	
5	20/1/21	K.MILO	42	H	89	
6	20/1/21	K.IBI	34	H	77	
7	20/1/21	K.PESY	21		46	
8	20/1/21	K.MILA	179	H	477	H
9	20/1/21	K.MEME	22		58	
10	20/1/21	K.MOCHI	24		53	
11	20/1/21	K.GEMBUL	28		124	H
12	20/1/21	K.KEKE	25		175	H
13	20/1/21	K.ONIX	52	H	70	
14	20/1/21	K.DUDUNG	24		25	
15	20/1/21	K.KECIL	47	H	39	
16	20/1/21	K.KUMAL	45	H	74	
17	20/1/21	K.YELLO	28		56	
18	20/1/21	K.HARUKA	22		50	
19	20/1/21	K.COKI	30		67	
20	20/1/21	K.MOMO	25		47	
21	20/1/21	K.GENDUT	33	H	63	
22	20/1/21	K.DOSKI	50		64	
23	27/1/21	K. SHAWN	63	H	90	
24	27/1/21	K. PIPO	34	H	52	
25	27/1/21	K. MIU	71	H	69	
26	27/1/21	K. KIMMI	109	H	102	
27	27/1/21	K. CICI	32		49	
28	27/1/21	K. MOKI	24		52	
29	27/1/21	K. SIKO	40	H	59	
30	03/2/21	K.MOEZA	91	H	73	
31	03/2/21	K. TONG	185	H	390	H
32	03/2/21	K.MARVEL	57	H	75	
33	03/2/21	K. MOI	36	H	94	

* Normal lab values feline from Idexx lab
SGOT = 0.00-32.00 u/L (H= high)
SGPT=12-115 u/L (H= high)

Table 2. SGOT and SGPT Levels in Stray Cats

NO	DATE	MARKET NAME	CODE	SGOT (U/L)	DES	SGPT (U/L)	DES
1	21/1/21	Pasar Pacar Keling Surabaya	PCK 1	65	H	97	
2	21/1/21		PCK 2	20		40	
3	21/1/21		PCK 3	75	H	110	H
4	21/1/21		PCK 4	34	H	76	
5	21/1/21		PCK 5	38	H	57	
6	21/1/21		PCK 6	43	H	78	
7	21/1/21		PCK 7	80	H	123	H
8	21/1/21		PCK 8	45	H	68	
9	21/1/21		PCK 9	42	H	83	
10	21/1/21		PCK10	41	H	59	

NO	DATE	MARKET NAME	CODE	SGOT (U/L)	DES	SGPT (U/L)	DES
11	21/1/21	Pasar Pucang Surabaya	PC 1	70	H	85	
12	21/1/21		PC 2	75	H	145	H
13	21/1/21		PC 3	32		48	
14	21/1/21		PC 4	38	H	76	
15	21/1/21		PC 5	128	H	238	H
16	21/1/21		PC 6	45	H	60	
17	21/1/21		PC 7	58	H	67	
18	21/1/21		PC 9	65	H	149	H
19	21/1/21		PC 10	35	H	67	
20	04/2/21	Pasar Keputran Surabaya	K1	48	H	64	
21	04/2/21		K3	60	H	59	
22	04/2/21		K8	86	H	116	H
23	04/2/21		K9	65	H	47	
24	04/2/21		K10	60	H	66	
25	04/2/21	Pasar Wonokromo Surabaya	W1	42	H	66	
26	04/2/21		W2	78	H	79	
27	04/2/21		W5	50	H	55	
28	04/2/21		W7	64	H	89	
29	04/2/21		W8	68	H	93	

* Normal lab values feline from Idexx lab
SGOT = 0.00-32.00 u/L (H= high)
SGPT= 12-115 u/L

SGOT, SGPT, arginase, lactate dehydrogenase and Gamma Glutamyl Transaminase are enzymes present in the liver. Still, they are free to leave the cells and enter the blood vessels beyond their normal levels when damage to the liver parenchyma cell occurs as shown in Table 2. However, SGOT and SGPT are considered the most effective because these enzymes will increase first and more drastically when compared to other enzymes if the liver is damaged.[8] Examining the levels of SGOT and SGPT in domesticated and stray cats will be one indicator to detect the presence of liver disease in these cats.

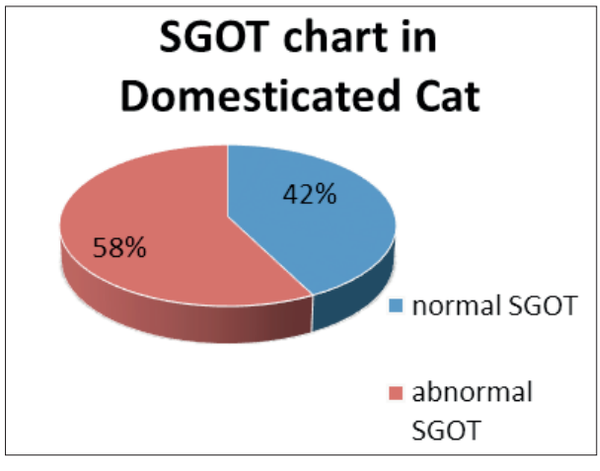

Figure 1. SGOT Chart in Domesticated Cat

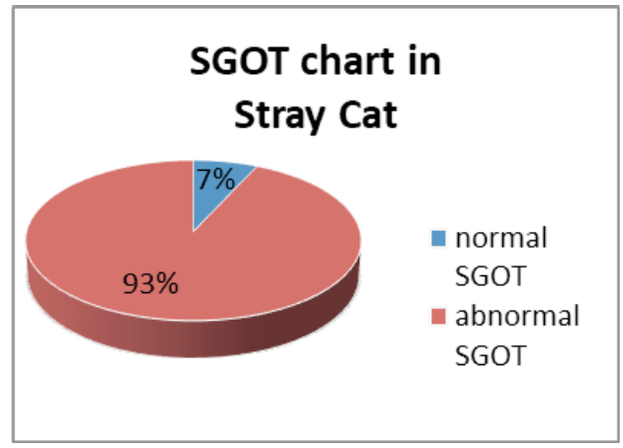

Figure 2. SGOT Chart in Stray Cat

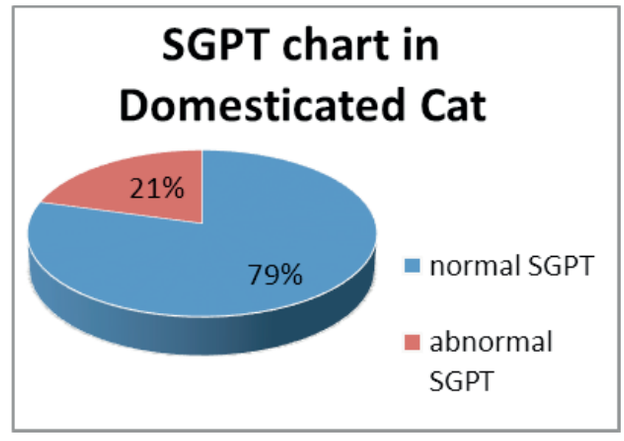

Figure 3. SGPT Chart in Domesticated Cat

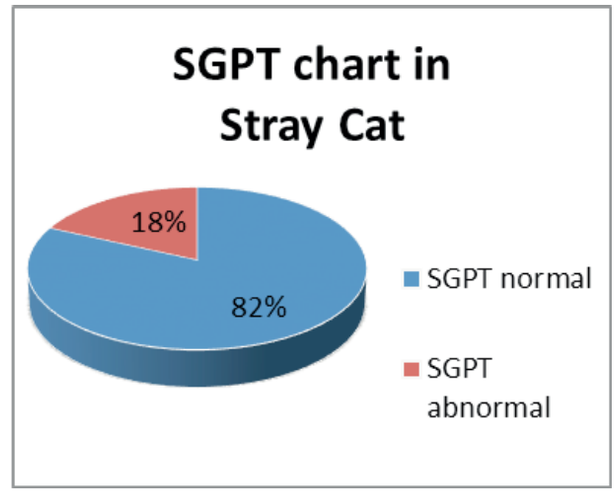

Figure 4. SGPT Chart in Stray Cat

By comparing the expected values of SGOT/AST and SGPT/ALT for cats the results of this study showed that, from 33 samples of

domesticated cats, 19 had higher levels of SGOT than expected (58%) as shown in Figure 1, and from 29 samples of stray cats, 27 had high levels of SGOT. In addition, SGOT was higher than expected (93%) as shown in Figure 2. For SGPT levels, from 33 domesticated cats, six samples had higher than normal levels of SGPT (21%) as shown in Figure 3, and from 29 samples of stray cats, six s had higher than normal levels of SGPT (18%) as shown in Figure 4.

Table.3. Mean Value SGOT in Domesticated Cat and Stray Cat

Cat	Mean	Significance
Domesticated	107.212	T hit < t table 1.049 < 2.000 Sig. (2 tailed) 0.299 > 0.05 Not significantly
Stray	84.827	

Table. 4. Mean Value SGPT in Domesticated Cat and Stray Cat

Cat	Mean	Significance
Domesticated	52.606	T hit < t table 0,49 < 2,000 Sig. (2 tailed) 0,626 > 0,05 Not significantly
Stray	56.896	

Analysis of independent t-test data SGOT value of all samples Sig. 2-tailed > 0.05 with a result of 0.626 > 0.05, indicating that the SGOT value in domesticated and stray cats was not significant as shown in Table 3. This also applies to the SGPT value with 0.299> 0.05, which means no significant difference between the SGPT value in domesticated and stray cats as shown in Table 4. From these results, it is explained that both stray cats and domestic cats can experience liver problems. This is evident from the effects of increased levels of SGOT and followed by levels of SGPT, which significantly increased above the average experienced by some cats. The most drastic increase in domesticated cats occurred in Yuka's cat, with an SGOT level of 141 u/L and an SGPT level of 422 u/L. Meanwhile, the most drastic increase in stray cats was cat blood samples taken from the Pucang market with an SGOT level of 128 u/L and an SGPT level of 238 u/L.

Evaluation of the SGOT and SGPT examinations results is one of the essential indicators for diagnosing liver disease in cats, just like humans. Because when the liver is damaged, the enzymes SGOT, SGPT, arginase, lactate dehydrogenase and Gamma Glutamyl Transaminase are free to leave the cells to enter the blood vessels more than expected and their levels in the blood increase.[10,11] Although there are other enzymes, SGOT and SGPT will increase first, and the growth is more extreme when compared to other enzymes.[8] The markers of liver cell abnormalities (hepatocellular) are caused by changes in permeability or damage to liver cell walls, increasing SGPT or SGOT.[12] Increased SGOT can persist in the circulation between 2-5 days, and so it is used as a biochemical marker to determine the presence of necrosis in liver cells.[2] Although SGOT and SGPT examinations from blood results are the gold standards to indicate liver disease, other supporting diagnoses are also needed, such as x-ray results, ultrasound, results of bilirubin, and Gamma Glutamyl Transaminase enzymes level, etc.

Liver disease in cats has several factors that can cause SGOT and SGPT enzymes to increase, for example, viral liver disease, liver ischemia caused by prolonged hypotension or acute heart failure, and heart damage due to drugs or toxins.[13,14] For example, the toxic effects of paracetamol in cats, which can come from a single-dose or cumulative dose manifested in methemoglobinemia and liver problem.[15] Paracetamol is metabolized in the liver, and the rest is metabolized in the kidney. [16] Cats with an amount of 10 mg/kg B.W. can cause symptoms of paracetamol poisoning. That matters because the cat cannot metabolize paracetamol due to the deficiency of the enzyme glucuronyl transferase.[17] Paracetamol contains NAPQI compounds that cannot be detoxified so that they form free radical toxic proteins and cause damage to cat liver cells.[18] In addition, paracetamol overdose can also cause hepatic cell necrosis in the centrilobular area, which causes acute liver failure.[19] An example of an organophosphate that farmers often use is diazinon.[20] Diazinon toxin will cause various damage in tissues, especially

in organs that function as detoxification, namely the liver.[21]

Another factor that can lead SGOT and SGPT enzymes to increase and cause liver damage is the entry of pathogenic microorganisms such as bacteria, viruses, fungi and parasites. A fungal microorganism that causes candidiasis, Candida albicans causes cases of hepatitis in male domesticated cats. As a result of this infection, the cat develops progressive hyperbilirubinemia, a nearly 10-fold increase in SGOT/AST and an SGPT/ALT increase of more than 18-fold from ordinary.[22]

Changes in SGOT and SGPT levels are related to the rate of protein metabolism; the level of physical activity may also influence cell generation.[23] Protein metabolism is related to the liver because it can adjust protein production with the body's protein requirements. The protein content in the blood is influenced by age and growth, nutrition intake, gender, hormones, pregnancy and lactation, stress, and fluid loss.[24] Likewise, the age factor affects total protein levels; at a young age, total protein levels tend to be higher.[25]

Strenuous physical activity can damage more muscle cells than the intermediate physical state acting correctly; it causes the occurrence of excessive circulation of SGOT in blood, because large amounts of serum glutamate oxaloacetate transaminase (SGOT) are found in muscle cells, liver cells, and heart muscle. And small amounts are found in other cells, such as cells of the kidney, pancreas, brain and erythrocytes.[26] So, it is necessary to have other continuous parameters to determine the presence of liver necrosis, that is, to check the levels of SGPT which have been considered a sensitive marker of liver disease and hepatotoxicity compared to SGOT levels.[27] Other factors such as obesity, genetics, and immune system disorders can also cause liver disease, driving an increase in SGOT and SGPT in the blood.

CONCLUSIONS

High SGOT and SGPT as the gold standard for detecting liver diseases can occur in all cats, including stray cats and domesticated cats, because these two enzymes increase to the most extreme and earlier than other enzymes when the liver is impaired. Other supporting diagnoses are also needed, such as x-ray results, ultrasound results, or results of bilirubin and Gamma Glutamyl Transaminase enzymes level.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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