RESEARCH ARTICLE

Some hematological and biochemical parameter levels in healthy Van cats at different age and gender

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Farklı yaş ve cinsiyetteki sağlıklı Van kedilerinde bazı hematolojik ve biyokimyasal parametre değerleri

Öz

Amaç: Bu çalışmada, farklı yaş ve cinsiyete sahip Van kedilerinde bazı hematolojik ve biyokimyasal parametrelerin normal değerleri ve bu parametrelerde yaş ve cinsiyete bağlı meydana gelen değişimlerin ortaya konulması amaçlandı.

Gereç ve Yöntem: Çalışmada farklı yaş ve cinsiyete sahip 60 sağlıklı Van kedisi kullanıldı. Her iki cinsiyetteki kediler; yaşlarına göre kendi aralarında 3 farklı gruba ayrıldı. 6-12 aylık kediler 1. grup, 12-24 aylık kediler 2. grup, 24-yukarı aylık olan kediler ise 3. grup olarak çalışmaya alındı. Alınan kan örneklerinden; hematolojik ve biyokimyasal parametre değerleri belirlendi.

Bulgular: Hematolojik parametrelerden hematokrit, hemoglobin ve platelet seviyeleri, biyokimyasal parametrelerden ise serum kreatinin seviyesi, laktat dehidrogenaz ve kreatinin kinaz-MB aktivitelerinde anlamlı farklılıklar tespit edildi.

Öneri: Farklı yaş ve cinsiyetteki sağlıklı Van kedilerinde bu parametrelerin normal değerlerinin belirlenmesinin; hastalıkların tanı ve prognozunun değerlendirilmesinde klinisyen hekimlere ve araştırıcılara yardımcı olacağı, yapılacak olan bilimsel çalışmalara katkı sağlayacağı kanısına varıldı.

Anahtar kelimeler: Van kedisi, hematolojik parametreler, biyokimyasal parametreler

Abstract

Aim: In this study, it was aimed to reveal normal values of some hematological and biochemical parameters in Van cats having different ages and gender and in these parameters the changes that occur depending on age and gender.

Materials and Methods: In this study, 60 healthy Van cats having different age and gender were used. The cats in both genders divided into 3 different groups among them according to their ages. The cats 6 to 12 months were taken to the study as 1st group, 12 to 24-month cats were taken to the 2nd group, and 24 to more-month cats were taken to the 3rd group. From blood samples received, hematological and biochemical parameter values were identified.

Results: Significant differences were found in hematocrit, hemoglobin and platelets levels from hematological parameters and in serum creatinine level, lactate dehydrogenase and creatinine kinase-MB activities from biochemical parameters.

Conclusion: It has been surmised that in healthy van cats in different ages and gender, the determination of normal values of these parameters will help clinician physicians and the researches in the assessment of diagnosis and prognosis of the diseases and will contribute to the scientific studies to be made.

Keywords: Van cat, hematological parameters, biochemical parameters

Introduction

Van cat is one of the important endemic cat races living in Van Lake and its surroundings, taking great interest in the world. Van cat that is an important value for Turkey and Van city is known as its eyes that are in different colors, being sincere, white and silky fur and being fond of water. The numbers of Van cats that used to be found in almost every house in Van region in the past decreased day by day and their generation has been face to face with extinction. For this reason, the race has been taken under protection and it has been subjected to many scientific studies in recent years (Eksen et al 1992, Gure 1993, Yuksek et al 2005, Altunok et al 2007, Sonmez and Agaoglu 2010).

It is stated that the identification of reference values peculiar to the species instead of the identification of reference values peculiar to the races will be more convenient and beneficial (Macun et al 2010). The identification of reference values of hematological and biochemical parameters is important in terms of the evaluation of pathological and physiological status occurred in the animals, the diagnosis of the diseases, prognosis, appropriate treatment selection and the evaluation of the results (Marco et al 2000, Lawler et al 2006, Macun et al 2010, Simsek et al 2015). In healthy animals, hematological and biochemical parameters are known to change due to gender, age, race, nourishing, live weight, stress, environmental conditions, climate and many other reasons (Eksen et al 1992, Turgut 2000, Lawler et al 2006, Macun et al 2010, Thrall et al 2012, Simsek et al 2015).

Many studies have been made about various subjects in Van cats that are an endemic race in Turkey and whose importance has been increasing day by day in Van region and Turkey in these studies, the physiological features, genetic formations of these animals, the presence of various diseases, the changes in hematological and biochemical parameters in various diseases and the relations of these parameters with the diseases have been revealed (Eksen et al 1992, Yuksek et al 2005, Altunok et al 2007, Macun et al 2010, Sonmez and Agaoglu 2010).

In healthy Van cats having different age and gender, it has not been carried out any detailed study about the normal values of hematological and biochemical parameters up to now. This study has been carried out with the aim of revealing the normal values of some hematological and biochemical parameters in healthy Van cats having different age and gender and to reveal the changes that occurred depending on the age and gender in these parameters.

Materials and Methods

The material of this study consists of 60 (30 female and 30 male) healthy Van cats having different age and gender who are found in the Research Center of Van cat in the University of Yuzuncu Yil and detected to be healthy as a result of the examination performed. The cats in both genders were divided into 3 different groups among themselves. The cats 6 to 12 months were taken to the study as 1st group, 12 to 24-month cats were taken to the 2nd group, 24 to more-month cats were taken to the 3rd group. This research was approved (26. 11. 2015 and 2015/13) by the Animal Research Ethics Committee of Yuzuncu Yil University in Van, Turkey.

For hematological and biochemical analysis, blood samples were taken from the cats in the tubes with and without anticoagulant from vena radials (V. cephalica) in accordance with the method were taken. For hematological examinations, from blood samples taken to the tubes with anticoagulant (with EDTA), hematocrit value (HCT), hemoglobin concentration (HGB), the number of leukocyte (WBC), average erythrocyte hemoglobin concentration (MCHC), the number and percentage of granulocyte, the number and percentage of lymphocytes/monocytes and the number of platelets (PLT) were identified with veterinary hematology device (QBC vet-autoreader®Idexx).

The blood samples taken to the tubes without anticoagulant were removed to serums after being centrifuged (Rotofix 32®-Hettich) in 3000 cycle/min. The serums obtained were kept at -20℃ in deep freeze until the measures were given. From serum samples, total protein (TP), albumin, globulin, glucose, blood urine nitrogen (BUN), creatinine, aspartate amino transferase (AST), alkaline phosphatase (ALP), alanine amino transferase (ALT), lactate dehydrogenase (LDH), creatinine kinase (CK) and creatinine kinase-MB (CK-MB) values were identified with auto analyzer device (Cobas-6000 c501®-Roche-Hitachi).

Kalmagrov Simirnov was performed on the data of the study as a normality test. Parametric methods were used for statistical analysis because the data showed normal distribution. Definitive statistics were performed for analyzing different gender and age groups. While independent t test were used for comparing the data of female and male animals, One WAY ANOVA test were used for comparing data of different ages belong to female and male animals. Tukey test were used as multiple comparison test between groups (SPSS 20.0). In the calculations P<0.05 values were accepted to be statistically significant.

Results

HCT (P<0.001), HGB (P<0.001) and PLT (P<0.05) levels had statistically differences between female and male cats. HCT and HGB levels were higher in male cats and PLT levels were higher in female animals (Table 1). It has been detected in different age groups of animals that HCT (P<0.001) and HGB

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(P<0.01) levels from different hematological parameters displayed statistical differences between the groups (Table 2). While some significant differences in female and male cats, in serum creatinine levels (P<0.001), LDH (P<0.01) and CK-MB (P<0.05) activities, no significant difference was found in the other biochemical parameters in sex differences (Table 3). In statistical comparisons of cats in different age groups, changes in serum creatinine levels (P<0.001), LDH (P<0.01) and CK-MB (P<0.05) activities were found statistically significant (Table 4).

Discussion

Due to giving important information to clinician physicians and researchers, the identification of normal values of many hematological and biochemical parameters, monitoring the health status and some illness processes of the animals are extremely important in terms of the evaluation of the diag-

nosis, treatment and prognosis of some diseases (Simsek et al 2014, Simsek et al 2015). That the studies about normal values of hematological and biochemical parameters of Van cats is less directed is to make a study in this direction. In this study, it was aimed to determine some hematological and biochemical parameter values in healthy Van cats having different age and gender.

It is known that hematological and biochemical parameters are reported to change depending on gender, age, race, live weight, environmental conditions, seasons and various reasons (Eksen et al 1992, Turgut 2000, Macun et al 2010, Thrall et al 2012). In this study, HCT, HGB (P<0.001) and PLT (P<0.05) levels in female and male cats were determined to show statistically significant differences (Table 1). In male animals, HCT and HGB levels were higher than female animals and PLT levels were lower. In other hematological parameters, the intergroup differences were not seen to be statis-

Table 1. Some hematological parameters in healthy female and male Van cats (Mean±SEM)

Parameters	Female (n: 30)	Male (n: 30)	Total (n: 60)	P
HCT (%)	35.7±1.1	42.6±0.8	39.9±0.9	P<0.001
HGB (g/dL)	11.5±0.4	13.6±0.3	12.8±0.3	P<0.001
WBC (x10^9/L)	13.6±1.0	13.6±0.8	13.6±0.6	---
MCHC (g/dL)	32.2±0.2	32.0±0.2	32.0±0.2	---
Granulocyte (x10^9/L)	8.2±0.6	8.9±0.9	8.6±0.6	---
Granulocyte (%)	61.6±3.6	63.5±2.7	62.8±2.1	---
L/M (x10^9/L)	5.4±0.7	4.8±0.4	5.0±0.4	---
L/M (%)	38.5±3.6	36.5±2.7	37.3±2.1	
PLT (x10^9/L)	417.3±38.0	301.1±23.8	345.2±22.8	P<0.05

Table 2. Some hematological parameters in female and male Van cats in different age groups (Mean±SEM)

Parameters	Female Group 1 (n: 12)	Female Group 2 (n: 8)	Female Group 3 (n: 10)	Male Group 1 (n: 7)	Male Group 2 (n: 10)	Male Group 3 (n: 13)	P
HCT (%)	36.1±1.1[bc]	33.3±3.4[c]	36.3±2.5[bc]	40.2±0.8[ab]	43.2±1.8[a]	42.9±1.0[a]	P<0.001
HGB (g/dL)	11.8±0.4[bcd]	10.8±1.1[d]	11.6±0.8[cd]	12.9±0.1[abc]	13.9±0.5[a]	13.7±0.3[ab]	P<0.01
WBC (x10^9/L)	14.2±0.6	12.1±2.5	13.6±2.7	16.8±3.4	14.4±2.3	13.0±0.9	---
MCHC (g/dL)	32.4±0.2	32.3±0.1	31.9±0.4	32.0±0.5	32.1±0.2	32.0±0.3	---
Granulocyte (x10^9/L)	8.0±1.0	8.5±1.0	8.4±1.4	13.7±4.6	8.0±1.5	8.3±0.9	---
Granulocyte (%)	56.2±6.8	71.5±6.5	63.3±2.8	79.5±11.5	55.7±1.9	62.9±2.9	---
L/M (x10^9/L)	6.3±1.1	3.6±1.5	5.2±1.3	3.1±1.2	6.4±0.9	4.7±0.4	---
L/M (%)	43.8±6.8	28.5±6.5	36.8±2.8	20.5±11.5	44.3±1.9	37.2±2.9	---
PLT (x10^9/L)	469.4±69.6	407.5±29.5	357.0±51.8	262.0±121.0	264.7±16.9	315.6±29.2	---

a, b, c, d: Different letters in the same line are statistically significant (P<0.05).

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Table 3. Some biochemical parameters of female and male Van cats (Mean±SEM).

Parameters	Female (n: 30)	Male (n: 30)	Total (n: 60)	P
TP (g/dL)	7.3±0.1	7.9±0.2	7.6±0.1	---
Albumin (g/dL)	3.2±0.1	3.4±0.1	3.3±0.1	---
Globulin (g/dL)	4.2±0.1	4.5±0.3	4.3±0.2	---
Glucose (mg/dL)	52.9±2.8	64.5±6.1	58.0±3.2	---
BUN (mg/dL)	18.9±0.8	20.1±0.5	19.4±0.5	---
Creatinine (mg/dL)	0.9±0.0	1.2±0.0	1.0±0.0	P<0.001
AST (U/L)	24.9±2.8	29.8±4.8	27.0±2.6	---
ALP (U/L)	44.0±4.5	36.5±4.8	40.8±3.3	---
ALT (U/L)	49.6±9.6	57.9±12.1	53.2±7.5	---
LDH (U/L)	303.4±31.4	157.9±15.0	239.7±21.4	P<0.01
CK (U/L)	156.4±24.2	192.6±35.1	172.3±20.4	---
CK-MB (U/L)	115.8±11.3	48.7±13.6	86.4±9.9	P<0.05

Table 4. Some biochemical parameters in female and male Van cats in different age groups (Mean±SEM).

Parameters	Female Group 1 (n: 12)	Female Group 2 (n: 8)	Female Group 3 (n: 10)	Male Group 1 (n: 7)	Male Group 2 (n: 10)	Male Group 3 (n: 13)	P
TP (g/dL)	7.1±0.2	7.1±0.3	7.6±0.2	8.2±1.0	7.7±0.2	7.9±0.3	--
Albumin (g/dL)	3.2±0.1	3.1±0.2	3.2±0.1	3.4±0.3	3.5±0.1	3.4±0.1	---
Globulin (g/dL)	4.0±0.2	4.0±0.5	4.4±0.1	4.5±1.5	4.2±0.3	4.6±0.4	---
Glucose (mg/dL)	50.1±3.2	57.8±8.2	54.3±5.2	97.0±51.6	68.3±14.2	58.5±4.3	---
BUN (mg/dL)	18.2±1.2	19.0±1.5	19.4±1.2	20.0±2.0	21.0±0.9	19.8±0.6	---
Creatinine (mg/dL)	0.9±0.0[bc]	0.9±0.1[c]	0.9±0.0[bc]	1.0±0.1[abc]	1.1±0.0[ab]	1.2±0.0[a]	P<0.001
AST (U/L)	21.1±1.3	21.7±5.5	29.4±5.8	20.9±2.50	21.3±2.0	34.1±6.9	---
ALP (U/L)	50.3±8.4	48.0±15.1	36.8±4.1	71.0±31.0	52.0±8.9	26.0±2.22	---
ALT (U/L)	34.7±5.2	39.6±11.8	67.0±20.0	41.1±15.7	39.5±2.3	66.9±17.7	---
LDH (U/L)	355.5±59.9[a]	251.3±42.3[ab]	264.3±33.5[ab]	250.0±49.0[ab]	138.0±26.7[b]	151.9±17.5[ab]	P<0.01
CK (U/L)	164.4±46.2	160.0±43.5	147.6±29.7	233.0±90.0	168.2±2.8	195.6±51.3	---
CK-MB (U/L)	124.6±15.4[a]	136.9±26.9[a]	101.7±19.1[ab]	95.4±90.1[ab]	28.8±25.6[b]	49.0±15.1[ab]	P<0.05

a, b, c, d: Different letters in the same line are statistically significant (P<0.05).

tically significant. In a study performed in Van cats (Sonmez and Agaoglu 2010), it has been stated that PCV, HGB, WBC and PLT levels are higher in male animals than female animals. Eksen et al (1992) emphasized that the number of RBC and the amount of HGB are higher in male than female animals and the amount of HGB, and the amount of HGB can increase as climbing high from the sea level depending on the altitude. In this study, in parallel with the above-mentioned notifications, HCT and HGB levels were higher in male cats than female cats. However, WBC levels were statistically insignificant between male and female cats and PLT levels were lower in

male cats than female cats (Table 1). The hematological values obtained in our study is close to the normal values stated for cats in various studies (Eksen et al 1992, Marco et al 2000, Rebar et al 2004, Altıntas et al 2006, Macun et al 2010, Sonmez and Agaoglu 2010) performed previously in Van cats and the other races but HCT and HGB levels were determined to be higher compared to the levels in these studies. The reason of this, as it is mentioned in some studies (Eksen et al 1992, Thrall et al 2012), is thought that HCT and HGB levels may be high depending on the altitude. Indeed, that the altitude of the province of Van where our study has been

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carried out is 1727 meters is in the quality of affirming this. In the animals, WBC levels were stated to show an increase depending on various stress factors, infectious and parasitic diseases (Marco et al 2000, Turgut 2000, Thrall et al 2012). In this study, that the WBC levels are identified on the normal limits mentioned for cats is associated with that the animals are healthy, making parasitic struggles regularly and being careful about not forming stress during bloodletting process. Simsek et al (2014) states that some changes may occur in hematological parameters depending on the age, HGB levels in kittens is lower, their HCT levels increased with age and the reason of this is stated to be associated with higher oxygen carrying capacity of blood in adult cats. Indeed, in the study they made, compared to the cats older than 3 months, in 1.5-3-month cats, WBC levels were stated to be higher, RBC, HGB and PCV levels were stated to be lower. In another study, on the contrary of this notification, it is reported that the number of RBC is more in the young than the old (Eksen et al 1992). In this study, although there are some changes among hematological parameters in the animals at different age groups having different gender, only the changes in HCT (P<0.001) and HGB (P<0.01) levels were detected to show statistically significance between groups (Table 2).

In this study, some biochemical parameter values obtained from the cats having different gender and ages were identified to be close to the normal value states in various studies (Marco et al 2000, Deniz 2001, Rebar et al 2004, Altıntas et al 2006, Macun et al 2010, Sonmez and Agaoglu 2010, Thrall et al 2012, Simsek et al 2015). In this study, serum creatinine levels (P<0.001), LDH (P<0.01) and CK-MB (P<0.05) activities in female and male cats, significant differences were determined depending on the gender (Table 3). In cats at different age groups, the changes in again only serum creatinine levels (P<0.001), LDH (P<0.01) and CK-MB (P<0.05) activities were statistically significant in intergroup comparison (Table 4). Due to age, gender and various reasons, it is stated that some changes can occur in many biochemical parameters (Marco et al 2000, Turgut 2000, Lawler et al 2006, Sonmez and Agaoglu 2010, Simsek et al 2014), some biochemical parameter values in Van cats are different in female, male cats and kittens (Sonmez and Agaoglu 2010). In the studies carried out (Marco et al 2000, Simsek et al 2014), there may be an increase in the animals during capture in masculine-based enzymes such as ALT, AST, CK and LDH depending on the physical stress that occurs in the animals and the levels of ALP, LDH, CK and glucose activities reduce with age, so these parameters are higher in the young than the old, besides the decrease in glucose level with age may be associated with weakening glucose regeneration in the liver. In our current study, in young animals in both genders, it has been detected that ALP activities in both groups are higher compared to the other groups, but the difference between them is not statistically significant (Table 4). When compared to the other species, even small changes in ALP activities in cats

are important, again in young animals, masculine-based ALP activity is higher, for this reason, it has been stated that ALP activity especially in the animals younger than 6 months is higher than the adult animals (Lawler et al 2006, Simsek et al 2014). It is stated that there may be some changes in serum creatinine, BUN, TP and albumin levels depending on age, gender and various reasons. The factors such as glomerular filtration, tubular reabsorption and secretion and total body skeleton muscle store may affect the level of creatinine, again there may be some changes in BUN levels depending on the age and diet, and high level of protein taking increases BUN level in the animals. It is stated that TP and albumin levels may change with the age, the increase in TP levels depending on age may depend on the decrease in body water or increase in the levels of gamma globulin (Simsek et al 2014). In this study, there are some differences between groups in these biochemical parameters in healthy cats but these differences were detected not to be statistically significant.

Conclusion

As a result of this, the normal values of hematological and biochemical parameters in Van cats and their changes due to gender and age were revealed with this study. Besides, it has been reached to a conviction that in Van cats at different age and gender the identification of normal values of hematological and biochemical parameters in the study will help to clinician physicians and researchers in the diagnosis of the diseases and the evaluation of prognosis and contribute to the scientific studies to be made.

Acknowledgments

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