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THE INFLUENCE OF AGE AND BODY CONDITION SCORE ON CERTAIN BLOOD BIOCHEMICAL PARAMETERS IN APPARENTLY HEALTHY AND DISEASED DOGS

By

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ABSTRACT

Epidemiological surveys performed in clinics and veterinary hospitals estimate the prevalence of canine obesity between 25-35%, while dogs are considered emaciated when they lose a substantial amount of both body fat and muscle tissue, resulting in a body weight that is at least 20 - 25% less than an ideal weight. Therefore, the present study was designed to classify 107 dogs according to their body condition scores; age and health state into four groups and investigate some of their biochemical blood constituents. Clinical examination findings associated with obesity and emaciation were recorded. In the apparently healthy group, old obese dogs showed a significant ($p<0.05$) increase in alkaline phosphatase enzyme (ALP) when compared with young ideal and emaciated dogs and old ideal dogs.Random blood sugar level showed significant ($p<0.05$) decrease in young emaciated dogs in comparable with young obese dogs and old emaciated dogs. While in the diseased group, old emaciated dogs showed a significant ($p<0.05$) increase in ALP when compared with young ideal, emaciated and obese dogs and old ideal dogs. Random blood sugar level showed significant ($p<0.05$) increase in young obese dogs in comparable with young ideal and emaciated dogs and old ideal, emaciated and obese dogs. It was concluded that age and body condition score have significant effect on different blood parameters and health state of the dog.

Key words:

Obesity. Emaciation. Age. Health state. Blood parameters.

INTRODUCTION

There are significant associations of 9-point body condition scoring with survival and lifespan of the animal, whereas body condition scores less than 5 and of 9 was found to be negatively associated with both **(Teng *et al.,* 2018).** Biochemical tests are useful in assessing the health status of the animal and their values are changed as age advances **(Chen *et al.,* 2013).**

Dogs that are overweight have a shortened life span and they are predisposed to other disease conditions including osteoarthritis, diabetes mellitus and certain types of neoplasia **(German *et al.,* 2018)** while neglect may lead to death due to disease, starvation and dehydration **(Bradley-Siemens *et al.,* 2018).** Starvation can occur in an animal that is eating, but have no ability to digest, absorb, and⁄ or utilize a sufficient quantity of nutrients **(Radostits *et al.,* 2000).** Records of extremely underweight or emaciated dogs were inspected and the most common initial abnormalities were hypoalbuminemia, thrombocytosis,anemia, elevated blood urea nitrogen (BUN) and elevated BUN/creatinine ratio **(Pointer *et al.,* 2013).**

So, the aim of the present study was designed to classify selected cases into groups and assess the effect of body condition score, age and health state on their biochemical parameters.

MATERIAL AND METHODS

Animals:

The present study was performed on 107 dogs of different breeds with different ages (2 months -15 years) and both sexes. The dogs were classified into two groups according to their age. Group one (ages from 2 month - 6 years) consists of 70 dogs. Group two (ages from 7years -15 years) consists of 37 dogs. These animals were divided into three groups according to their body condition score into obese, emaciated and ideal to investigate their biochemical constituent of blood as illustrated in (Tables 1, 2).

Table (1): Animals used in young ages study from two month to six years old.

Group 1	From (2month-6years)		Total = 70 dogs
Condition	Ideal	Emaciated	Obese
Apparently healthy	3	8	20
Clinically diseased	3	24	12

Table (2): Animals from seven years to fifteen years old used in the old- ages study from seven years to fifteen years old.

Roup 2	From (7years-15years)		Total=37 dogs
Condition	Ideal	Emaciated	Obese
Apparently healthy	3	3	4
Clinically diseased	3	20	4

Table (3): Classification of selected cases according to BCS, used according to Laflamme *et al.* (1994) and Laflamme (1997).

Massive deposits of fat over thorax, spine and base of tail, also fat deposits on neck and limbs. Ribs not palpable. No waist or abdominal tuck present.	**Considered obese**
No excess fat over ribs, which are easily palpable. Definite waist and abdominal tuck present.	**Considered ideal**
No discernable body fat. Ribs, lumbar vertebrae, pelvic bones and all bony prominences are evident from a distance. Dog is showing obvious loss of muscle mass.	**Considered emaciated**

Blood samples:

Blood samples were collected by either allowing the blood to flow freely from cephalic vein through a clean dry needle into a clean dry container to obtain serum samples. Samples kept in standing position at room temperature for 2 hours, stored overnight in the refrigerator at 4°C then centrifuged at 3000 rpm for 10 minutes and used for determination of serum Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Alkaline phosphatase (ALP),

gamma glutamyl transferase (GGT), Creatinine and Blood urea nitrogen (BUN) according to **Bergmeyer *et al*. (1978), Bowers and Mccomb (1966), Szasz (1969), Lustgarten and Wenk (1972) and Marsh *et al.* (1965),** respectively. The reagent kits were manufactured by Stanbio Laboratories incorporation, U.S.A**.** Or by ear puncture for estimation of random blood glucose level on spot by using glucometer device. Glucometer device were manufactured by Bayer, Germany.

Statistical analysis:

Data were expressed as mean ± SE (standard error of mean). Statistical comparison between the mean of the different groups was made by Univariate test (two-way analysis of variance ANOVA) and multiple comparison between groups (post hoc) LSD using SPSS version (24). A probability (P value) of ≤ 0.05 was assumed for statistical significance according to **Yasunori (1993).**

RESULTS

Clinical signs:

The main clinical findings of the presented cases were various, multisystemic and briefed as follow: cardiovascular disorders: such as, anemia and dehydration, orthopedic disorders: such as fracture and hip luxation, dermatological disorders: most commonly skin infections, ulcers, excessive scale, erythema,alopecia or poor hair growth,urinary abnormalities:such as urinary incontinence or urine retention,respiratory cardinal signs:such as coughing or abnormal breathing pattern, digestive tract abnormalities: such as,vomiting or diarrhea and reproductive abnormalities: such as dystocia or infertility.Some of the clinical signs are shown in Fig.(1, 2).

Fig. (1): clinical presentation of group 1.

a) Four years old obese dog with multiple skin lesions.

b) Three years old apparently healthy ideal dog.

c) Three month old emaciated diseased dog with vomiting, diarrhea and severe dehydration.

d) Six years old emaciated dog with respiratory manifestations.

e) Two years old emaciated dog with apparently healthy signs.

f) One year old ideal dog with tick infestation.

Fig. (2): clinical presentation of group 2.

a) Seven years old obese diseased dog with vomiting and lethargy.

b) Thirteen years old emaciated dog with cataract.

c) Twelve years old obese dog with anorexia and vomiting.

d) Nine years old emaciated dog with multiple skin wounds.

e) Forty years old emaciated dog with anorexia and severe dehydration.

f) Nine years old obese dog with skin allergy.

g) Eight years old apparently healthy obese dog.

Results of urea, creatinine, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), gamma glutamyl transferase (GGT) and random blood sugar.

Effect of age and body condition on urea, creatinine, AST, ALT, ALP, GGT and random blood sugar of apparently healthy dogs: Mean values are illustrated in (Table 4)**.** Fig. (3). Statistical analysis of our data showed no significant difference in the values of urea, Creatinine and AST of emaciated and obese young dogs in comparable with ideal, emaciated and obese old dogs. Old emaciated dogs showed a significant ($p<0.05$) decrease in ALT when compared with young emaciated dogs and old ideal dogs. Also, old obese dogs showed a significant ($p<0.05$) increase in ALP when compared with young ideal and emaciated dogs and old ideal dogs. Old obese dogs showed a significant ($p<0.05$) increase in GGT when compared with young ideal, emaciated and obese dogs and old ideal dogs. Random blood sugar level showed significant ($p<0.05$) decrease in young emaciated dogs in comparable with young obese dogs and old emaciated dogs.

Table (4): Effect of age and body condition on the values of urea, creatinine, AST, ALT, ALP, GGT and random blood sugar in apparently healthy dogs.

Parameters	Young dogs			Old dogs		
	Ideal	Emaciated	Obese	Ideal	Emaciated	Obese
Urea (mg/dl)	16.33 ± 2.37 a	16.31 ± 1.30 a	18.46± 1.56 a	21.87 ± 4.93 a	13.32 ± 1.62 a	16.73± 0.82 a
Creatinine (mg/dl)	1.10 ± 0.04 a	1.09 ± 0.03 a	1.35 ± 0.13 a	1.50 ± 0.22 a	0.77 ± 0.03 a	1.28 ± 0.08 a
AST (U/L)	90.67 ± 26.74 a	71.17 ± 9.72 a	83.76 ± 6.69 a	106.00± 18.33 a	101.17± 48.42 a	104.50± 5.66 a
ALT (U/L)	83.67 ± 24.69 ab	117.71± 13.96 a	95.65 ± 8.15 ab	108.67± 15.81 a	52.00 ± 22.19 b	93.75± 2.14 ab
ALP (U/L)	42.57 ± 3.59 a	56.33 ± 17.33 a	77.14 ± 16.88 ab	57.33 ± 6.36 a	66.13 ± 7.23 ab	120 ± 32.96 b
GGT (U/L)	7.47 ± 1.09 a	5.40 ± 0.40 a	8.82 ± 1.20 a	4.33 ± 1.45 a	11.12 ± 2.59 ab	19.63 ± 3.68 b
Random blood sugar (mg/dl)	83.33 ± 2.96 ab	71.00 ± 7.31 a	85.89 ± 1.95 b	79.00 ± 2.08 ab	92.00 ± 9.76 b	82.25± 6.61 ab

Values represent means ± SE (Standard error) N= numbers of dogs.

Means with different letters within the same row are significantly different at $p < 0.05$.

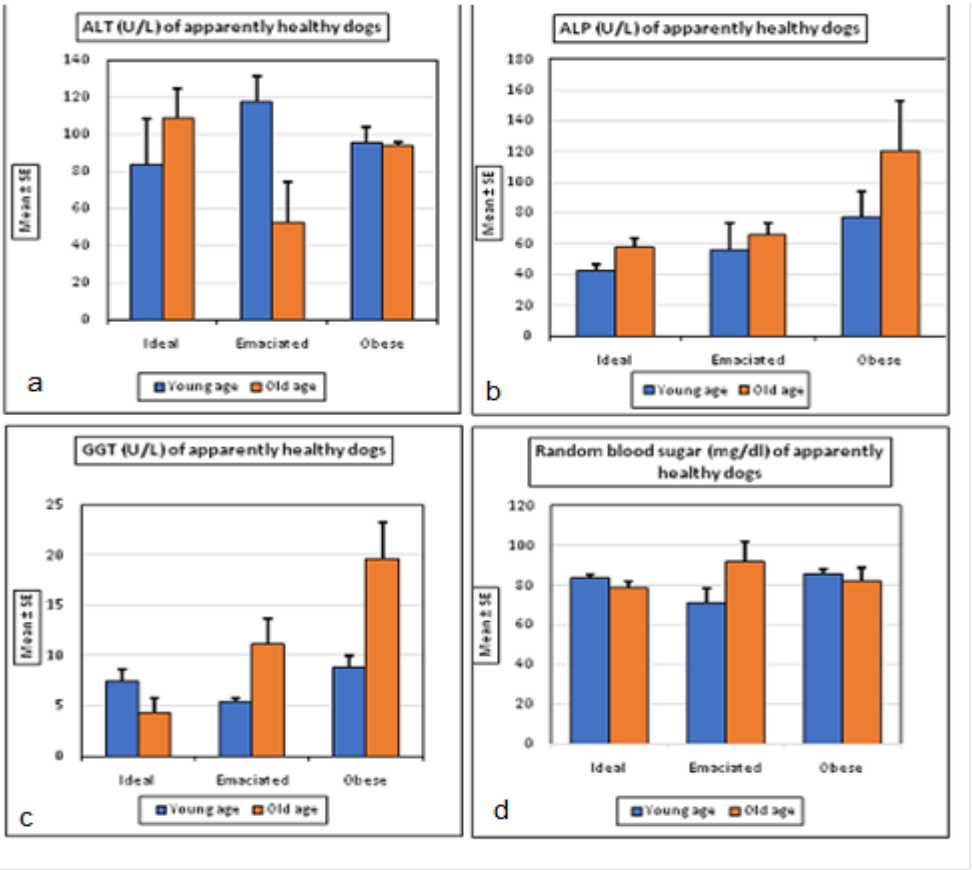

Fig. (3): Effect of age and body condition on the values of ALT, ALP, GGT and random blood sugar in apparently healthy dogs.

Effect of age and body condition on urea, creatinine, AST, ALT, ALP, GGT and random blood sugar of diseased dogs: Mean values are illustrated in (Table 5) and Fig. (4). Statistical analysis of our data showed no significant difference in the values of Creatinine, ALT and GGT of ideal, emaciated and obese young dogs in comparable with ideal, emaciated and obese old dogs.Young obese dogs showed a significant ($p<0.05$) decrease in Urea in comparison to young emaciated dogs. Old ideal dogs showed a significant ($p<0.05$) decrease in AST when compared with young emaciated and obese dogs and old emaciated and obese dogs. Also, old emaciated dogs showed a significant ($p<0.05$) increase in ALP when compared with young ideal, emaciated and obese dogs and old ideal dogs. Random blood sugar level showed significant ($p<0.05$) increase in young obese dogs in comparable with young ideal and emaciated dogs and old ideal, emaciated and obese dogs.

Table (5): Effect of age and body condition on the values of urea, creatinine, AST, ALT, ALP, GGT and random blood sugar in diseased dogs.

Parameters	Young dogs			Old dogs		
	Ideal	Emaciated	Obese	Ideal	Emaciated	Obese
Urea (mg/dl)	21.65 ± 0.75 ab	37.13 ± 5.59 a	17.59 ± 1.10 b	20.33± 0.88 ab	29.90± 4.09 ab	21.88 ± 8.35ab
Creatinine (mg/dl)	1.37 ± 0.07 a	1.72 ± 0.18 a	1.31 ± 0.07 a	0.77 ± 0.03 a	1.77 ± 0.20 a	1.48 ± 0.24 a
AST (U/L)	130.75± 28.96ab	154.57 ± 10.57 b	156.4± 26.03 b	47.67 ± 1.20 a	160.48 ± 16.20 b	169.00± 38.6b
ALT (U/L)	124.75 ± 30.34 a	183.30 ± 16.71 a	190.8± 29.71 a	171.00± 18.5a	178.05 ± 20.91 a	150.40± 40.1a
ALP (U/L)	81.33 ± 5.89 a	108.42 ± 28.14 a	79.40 ± 8.86 a	113.33± 7.75a	230.75 ± 18.44 b	149.33± 18.21ab
GGT (U/L)	7.00 ± 2.03 a	14.20 ± 7.12 a	8.47 ± 0.32 a	6.90 ± 1.68 a	15.40 ± 9.47 a	19.13 ± 1.49 a
Random blood sugar (mg/dl)	66.67 ± 5.24 a	70.88 ± 2.58 a	95.70 ± 2.82 b	73.00 ± 4.04 a	73.92 ± 3.23 a	75.67 ± 3.53a

Values represent means ± SE (Standard error)

N= numbers of dogs

Means with different letters within the same row are significantly different at $p < 0.05$.

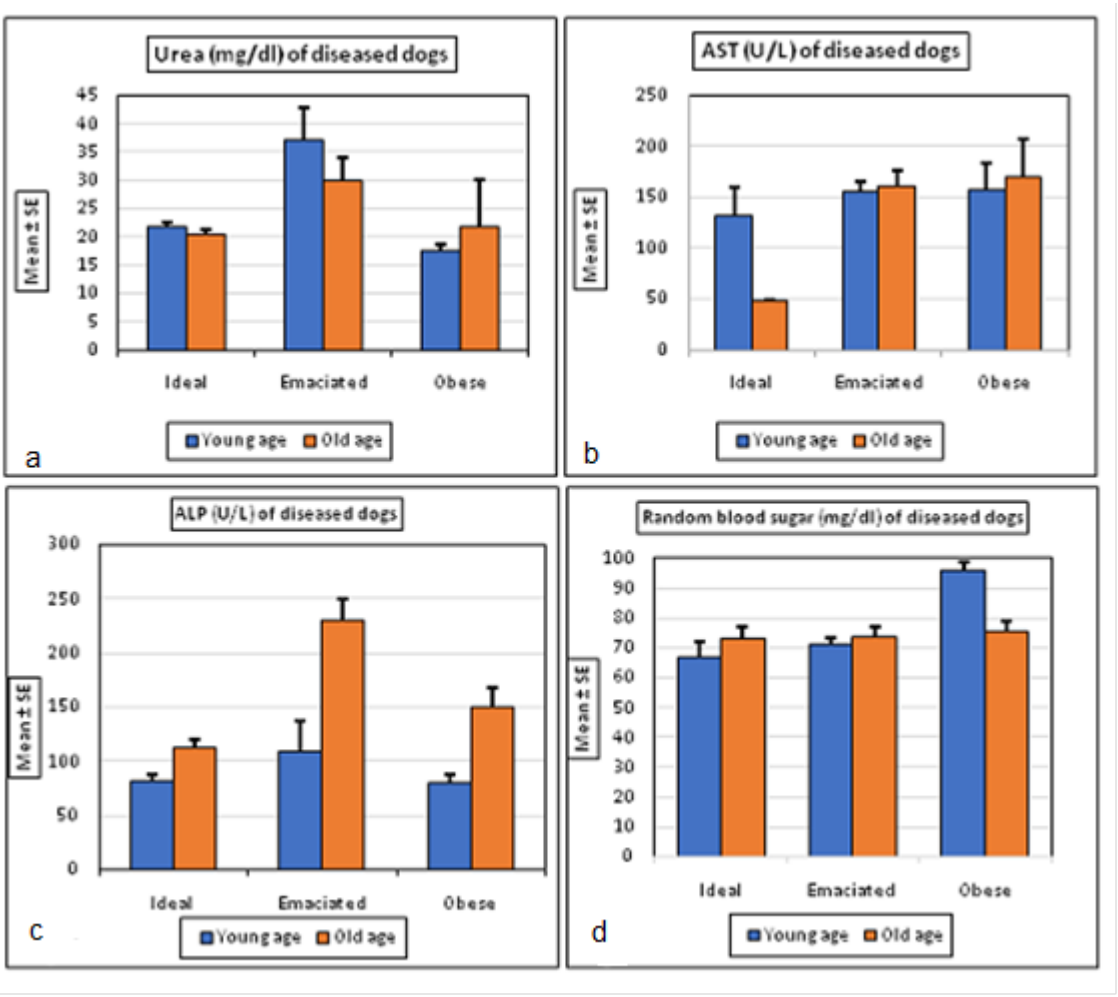

Fig. (4): Effect of age and body condition on the values of urea, AST, ALP and random blood sugar in diseased dogs.

Effect of health condition and body condition on urea, creatinine, AST, ALT, ALP, GGT and random blood sugar of young dogs: Mean values are illustrated in (Table 6), Fig. (5). Statistical analysis of our data showed no significant difference in the values of ALP and GGT of apparently healthy ideal, emaciated and obese dogs in comparable with diseased ideal, emaciated and obese dogs. Emaciated diseased dogs showed a significant ($p<0.05$) increase in urea level when compared with ideal, emaciated and obese apparently healthy dogs and ideal and obese diseased dogs. Also, emaciated diseased dogs showed a significant ($p<0.05$) increase in creatinine level when compared with ideal and emaciated apparently healthy dogs. Emaciated apparently healthy dogs showed a significant ($p<0.05$) decrease in AST when compared with emaciated and obese diseased dogs. Also, emaciated and obese diseased dogs showed a significant ($p<0.05$) increase in ALT when compared with ideal and emaciated apparently healthy dogs. Concerning random blood sugar level, obese diseased dogs showed significant ($p<0.05$) increase when compared with ideal, emaciated and obese apparently healthy dogs and ideal and emaciated diseased dogs. Also, ideal and obese apparently healthy showed significant ($p<0.05$) increase when compared with emaciated apparently healthy dogs and ideal, emaciated and obese diseased dogs.

Table (6): Effect of health condition and body condition on the values of urea, creatinine, AST, ALT, ALP, GGT and random blood sugar in young dogs.

Parameters	Ideal		Emaciated		Obese	
	Apparently healthy	Diseased	Apparently healthy	Diseased	Apparently healthy	Diseased
Urea (mg/dl)	16.33 ± 2.37 a	21.65 ± 0.75 a	16.31± 1.30 a	37.13± 5.59 b	18.46 ± 1.56 a	17.59± 1.10 a
Creatinine (mg/dl)	1.10 ± 0.04 a	1.37 ± 0.07 ab	1.09± 0.03 a	1.72± 0.18 b	1.35 ± 0.13 ab	1.31 ± 0.07 ab
AST (U/L)	90.67 ±26.74ab	130.75± 28.96ab	71.17± 9.72 a	154.57± 10.57 b	83.76 ± 6.69 a	156.45± 26.03b
ALT (U/L)	83.67 ± 24.69 a	124.75± 30.34ab	117.71± 13.96 a	183.30± 16.71 b	95.65 ± 8.15 a	190.82± 29.71b
ALP (U/L)	42.57 ± 3.59 a	81.33 ± 5.89 a	56.33± 17.33 a	108.42± 28.14 a	77.14± 16.88 a	79.40 ± 8.86 a
GGT (U/L)	7.47 ± 1.09 a	7.00 ± 2.03 a	5.40± 0.40 a	14.20± 7.12 a	8.82± 1.20 a	8.47 ± 0.32 a
Random blood sugar (mg/dl)	83.33 ± 2.96 b	66.67 ± 5.24 a	71.00± 7.31 a	70.88± 2.58 a	85.89 ± 1.95 b	95.70 ± 2.82 c

Values represent means ± SE (Standard error).

N= number of dogs.

Means with different letters within the same row are significantly different at $p < 0.05$.

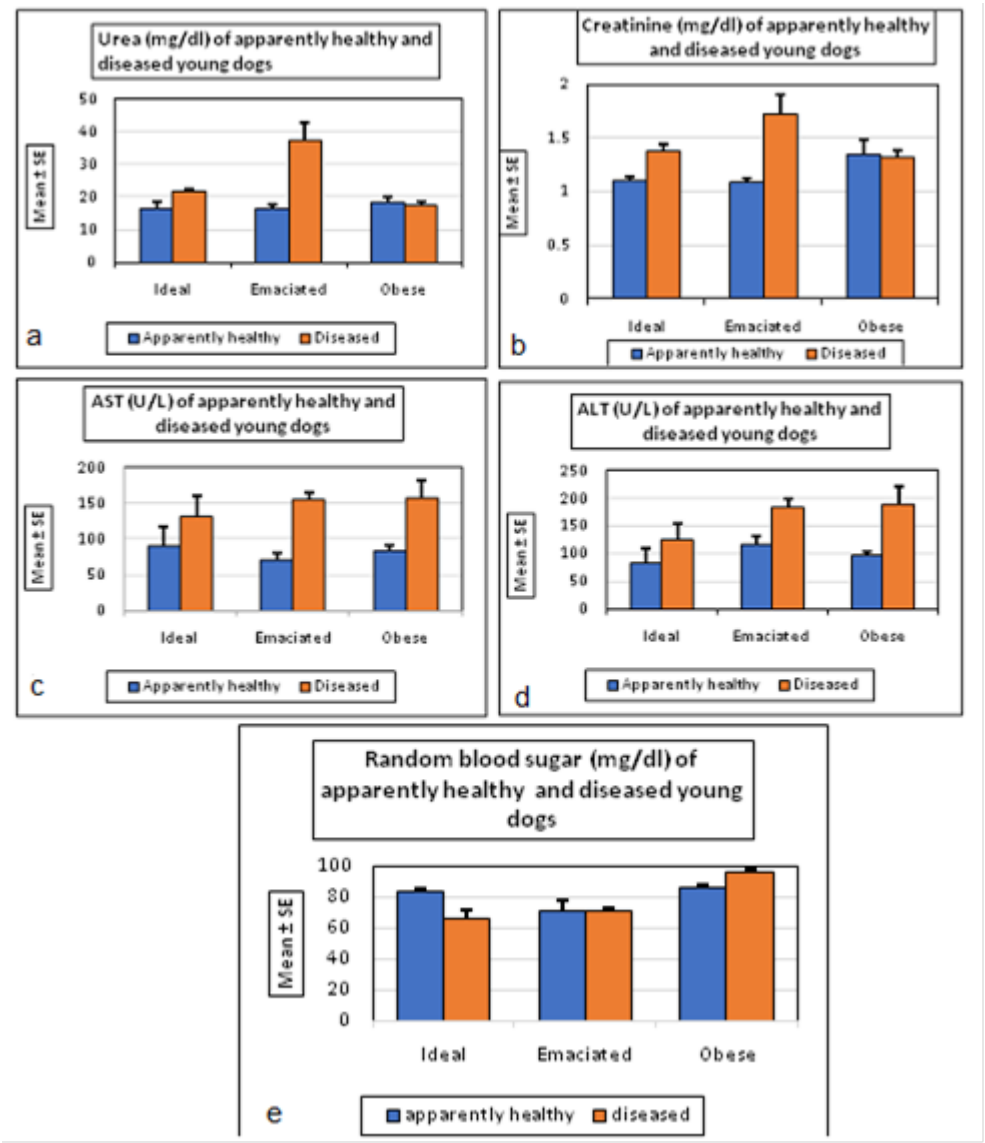

Fig. (5): Effect of health condition and body condition on the values of urea, creatinine, AST, ALT and random blood sugar in young dogs.

Effect of health condition and body condition on urea, creatinine, AST, ALT, ALP, GGT and random blood sugar of old dogs: Mean values are illustrated in (Table 7), Fig. (6). Statistical analysis of our data showed no significant difference in the values of urea level of apparently healthy ideal, emaciated and obese dogs in comparable with diseased ideal, emaciated and obese dogs. Emaciated diseased dogs showed a significant ($p<0.05$) increase in creatinine level when compared with emaciated apparently healthy dogs and ideal diseased dogs. Ideal diseased dogs showed a significant ($p<0.05$) decrease in AST when compared

with emaciated and obese diseased dogs. Also, emaciated apparently healthy dogs showed a significant ($p<0.05$) decrease in ALT when compared with ideal and emaciated diseased dogs. Emaciated diseased dogs showed a significant ($p<0.05$) increase in ALP when compared with ideal, emaciated and obese apparently healthy dogs and ideal and obese diseased dogs.

Also, ideal healthy dogs showed a significant ($p<0.05$) decrease in GGT when apparently healthy and diseased obese dogs. Concerning random blood sugar level, emaciated apparently healthy dogs showed significant ($p<0.05$) increase when compared with ideal and emaciated diseased dogs.

Table (7): Effect of health condition and body condition on the values of urea, creatinine, AST, ALT, ALP, GGT and random blood sugar in old dogs.

Parameters	Ideal		Emaciated		Obese	
	Apparently healthy	Diseased	Apparently healthy	Diseased	Apparently healthy	Diseased
Urea (mg/dl)	21.87± 4.93 a	20.33± 0.88 a	13.32± 1.62 a	29.90± 4.09 a	16.73± 0.82 a	21.88 ± 8.35 a
Creatinine (mg/dl)	1.50± 0.22 ab	0.77± 0.03 a	0.77± 0.03 a	1.77 ± 0.20 b	1.28± 0.08ab	1.48 ± 0.24 ab
AST (U/L)	106.00± 18.33ab	47.67± 1.20 a	101.17± 48.42ab	160.48± 16.20 b	104.50± 5.66ab	169.00± 38.65 b
ALT (U/L)	108.67± 15.81ab	171.00± 18.58b	52.00± 22.19 a	178.05± 20.91 b	93.75± 2.14 ab	150.40± 40.10ab
ALP (U/L)	57.33± 6.36 a	113.33± 7.75 b	66.13± 7.23 a	230.75± 18.44 c	120.00± 32.96 b	149.33± 18.21 b
GGT (U/L)	4.33 ± 1.45 a	6.90± 1.68 ab	11.12± 2.59 ab	15.40± 9.47 ab	19.63± 3.68 b	19.13 ± 1.49 b
Random blood sugar (mg/dl)	79.00± 2.08ab	73.00± 4.04 a	92.00± 9.76 b	73.92± 3.23 a	82.25± 6.61 ab	75.67 ± 3.53 ab

Values represent means ± SE (Standard error). N= number of dogs.

Means with different letters within the same row are significantly different at $p < 0.05$.

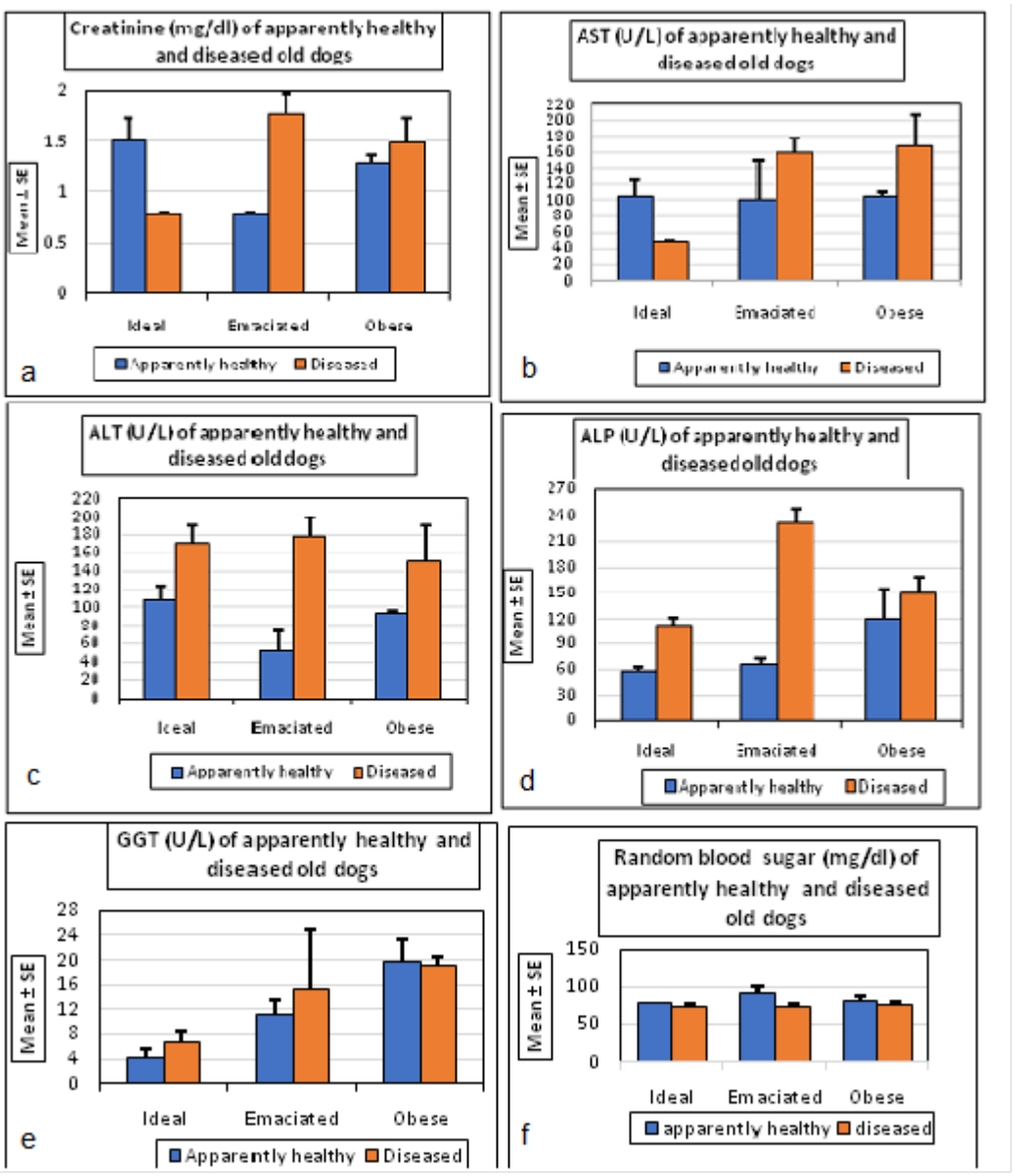

Fig. (6): Effect of health condition and body condition on the values of creatinine, AST, ALT, ALP, GGT and random blood sugar in old dogs.

DISSCUSSION

Knowledge of obesity/overweight as a risk factor for disease can heighten awareness and target health screening of dogs **(Lund *et al.,* 2006).** Interpretation of serum chemistry values is affected by factors such as species, breed, age, sex, environment and disease. Also, their changes during senescence are not fully distinguished and are not agreed upon by all investigators **(Lowseth *et al.,* 1990).** In the present study a total number of 107 dogs of different breeds, ages and sexes were included. The diseased dogs were presented with various clinical presentations. Regarding the effect of age and body condition score on alanine aminotransferase (ALT), alkaline phosphatase (ALP), gamma glutamyl transferase (GGT) and random blood sugar of apparently healthy dogs in (Table 4), old emaciated dogs showed a significant decrease in ALT when compared with young emaciated and old ideal dogs.

This result coincided with **Sauberlich *et al.* (1972),** but disagreed with **(Thomassen, 1972).** Decreasing ALT with age signifies a decrease in the mass or function of the normal liver **(Gagliano *et al.,* 2007).** Also, old obese dogs showed a significant increase in ALP when compared with young ideal and emaciated dogs and old ideal dogs. This is similar to results obtained by **Pickrell *et al.* (1974)** who noted that, the level of ALP at 9 to 10 years similar to the level at 2 to 3 months of age, with lower levels in between. Recently, an ALP isozyme was reported to be expressed in adipocytes, which is implicated to raise fat depots during the course of enhanced adipogenesis in obesity and this isoenzyme might me the source of increased ALP in obese dogs **(Ali *et al.,* 2013).** Old obese dogs showed a significant increase in GGT when compared with young ideal, emaciated and obese dogs and old ideal dogs. **Perry *et al.* (1998)** hypothesized that elevated GGT levels in case of obesity are a marker for visceral fat, and specifically for hepatic steatosis (fatty-liver). Random blood sugar level showed significant decrease in young emaciated dogs in comparable with young obese dogs and old emaciated dogs. This result coincided with **Kealy *et al.* (2002)** who noticed lower glucose level in dogs had weight loss. While **Borne *et al.* (1996)** claimed that glucose level is normal in obese dogs and hypothesized that glucose remains unchanged because the dogs were not grossly obese. Regarding the effect of age and body condition on urea, Aspartate aminotransferase (AST), ALP and random blood sugar of diseased dogs in (Table 5), old ideal dogs showed a significant decrease in AST when compared with young emaciated and obese dogs and old emaciated and obese dogs. The results were approved by **Pointer *et al.***

(2013) who explained the rise in AST in emaciated dogs due to Skeletal or cardiac muscle damage or may be due to hepatocyte damage. Also, old emaciated dogs showed a significant increase in ALP when compared with young ideal, emaciated and obese dogs and old ideal dogs. This is in agreement with **Gundberg *et al.* (2002)** who suggested that the increment of ALP activity in later decades of human life due to specific osteoblast activity reflected by this marker responds differently to the physiologic changes that occur later in life and affected by age, gender, and race or ethnicity. Random blood sugar level showed significant increase in young obese dogs in comparable with young ideal and emaciated dogs and old ideal, emaciated and obese dogs which coincided with **Kaspar and Norris (1977)** and opposite to **Mckelvie *et al.* (1966).** The reason for the discrepancy in these results is not known.

However, it has been shown that liver glycogen stores decrease with age.

The decreased glycogen stores may be at a critically low point at approximately 12 years of age **(Mosier, 1979).** Regarding the effect of health condition and body condition on urea, creatinine, AST, ALT and random blood sugar of young dogs in (Table 6), emaciated diseased dogs showed a significant increase in urea level when compared with ideal, emaciated and obese apparently healthy dogs and ideal and obese diseased dogs.

Also, emaciated diseased dogs showed a significant increase in creatinine level when compared with ideal and emaciated apparently healthy dogs. This came in agreement with **Pointer *et al.* (2013)** who reported high levels of kidney enzymes associated with starvation in dogs. Emaciated and obese diseased dogs apparently healthy dogs showed a significant increase in AST when compared with emaciated apparently healthy dogs. The rise in AST may be due to cellular injury arising during heart disease and liver disease **(Chambers *et al.* 1984)**. Also, emaciated and obese diseased dogs showed a significant increase in ALT when compared with ideal and emaciated apparently healthy dogs. The increment of ALT in emaciated diseased dogs came in acceptance with **Furlanello *et al.* (2005)** who related that to Canine babesiosis in which, dogs suffer from different disease conditions such as dehydration, apathy, anorexia or decrease appetite, fever and anemia. Concerning random blood sugar level, obese diseased dogs showed significant increase when compared with ideal, emaciated and obese apparently healthy dogs and ideal and emaciated diseased dogs. This resembles what was puplished by **Karunakaran *et al*. (2011)**. The increment of glucose level in obese diseased cases may be due to impaired insulin secretion together with insulin

resistance which does not always require insulin for its management and typically develops in older, inactive and obese patients **(Gilor *et al*, 2016).** Regarding effect of health condition and body condition on creatinine, AST, ALT, ALP, GGT and random blood sugar of old dogs in **(Table 7**), emaciated diseased dogs showed a significant increase in creatinine level when compared with emaciated apparently healthy dogs and ideal diseased dogs. This came in similarity with **Stockholm and Scott (2002)** who referred the increment of creatinine to gastrointestinal bleeding and increased proteolysis which can also cause an increased BUN and BUN/creatinine ratio or due to either intensive body loss or diminshed glomerular filteration as explained by **Ling *et al.* (1977).** Emaciated and obese diseased dogs showed a significant increase in AST when compared with ideal diseased dogs. Also, ideal and emaciated diseased dogs showed a significant increase in ALT when compared with emaciated apparently healthy dogs. The increased AST and ALT in diseased dogs coincided with **Valentine *et al*. (1990)** who related this may be due to muscular dystrophy. Emaciated diseased dogs showed a significant increase in ALP when compared with ideal, emaciated and obese apparently healthy dogs and ideal and obese diseased dogs. The increment of ALP in diseased cases could be explained by **Willard and Twedt (2004)** who stated that ALP measurement is indicated when systemic disease, including weight loss, hepatomegaly, vomiting and diarrhea, Also, apparently healthy and diseased obese dogs showed a significant increase in GGT with ideal healthy dogs. The increment in disease obese dogs may be due to necrosis, cholestasis and compromised liver function **(Ramaiah,2007).** Concerning random blood sugar level, emaciated apparently healthy dogs showed significant increase when compared with ideal and emaciated diseased dogs. This is coincided with **Mattheeuws *et al.* (1987)** who claimed that obese dogs present high levels of plasma glucose and insulin, which are sometimes referred to as intolerance to glucose and hyperinsulinemia.

CONCULOSION

This study affirms that body condition scores have direct impact on blood biochemical parameters of dogs in reference to their age and health state. Therefore it is a necessity to make a routine blood examination for obese or emaciated dogs to overcome their underlining health issue. Spread awareness among clients from the risk of bad feeding habits or neglect on their dogs. Maintain a proper healthy diet and a regular physical activity to dogs.

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الملخص العربي

تقدر الدراسات الاستقصائية الوبائية التي أجريت في العيادات والمستشفيات البيطرية مدى انتشار السمنةالمرضية بين الكلاب بنسبة 25-35٪ ، في حين تعتبر الكلاب هزيلة عندما تفقد كمية كبيرة من كلا من دهون الجسم والأنسجة العضلية ، مما يؤدي إلى نقصان وزن الجسم بنسبة 20- 25 ٪ أقل من الوزن المثالي. لذلك ، تم تصميم هذه الدراسة لتصنيف 107 كلاب حسب درجات حالتهم الجسمية و العمر والحالة الصحية إلى أربع مجموعات والتحقيق في بعض مكونات الدم البيوكيميائية. تم تسجيل نتائج الفحص الاكلينيكي المرتبطة بالسمنة والهزال. في المجموعة السليمة، أظهرت الكلاب السمينه المتقدمه في العمرزيادة معنوية (P <0.05) في ALP بالمقارنة مع الكلاب الشابة مثالية الوزن والكلاب مثالية الوزن المتقدمه في العمر. أظهر مستوى السكر في الدم العشوائي انخفاضا كبيرا (P <0.05) في الكلاب الشابة الهزيلة من مقارنة مع الكلاب السمينة الشابه والكلاب الهزيلة المتقدمة في العمر. بينما في المجموعة المريضة ، أظهرت الكلاب الهزيلة المتقدمة في العمر زيادة (p <0.05) في ALP بالمقارنة مع الكلاب الشابة مثالية الوزن والسمينة والكلاب مثالية الوزن المتقدمة في العمر. وأظهر مستوى السكر في الدم العشوائي زيادة (p <0.05) في الكلاب الشابة السمينة بالمقارنة مع الكلاب الشابةمثالية الوزن و الهزيلة والكلاب المتقدمة في العمرمثالية الوزن و الهزيلة والسمينة. واستنتجنا أن درجة العمر وحالة الجسم لها تأثير كبير على معايير الدم المختلفة والحالة الصحية للكلب.