

Investigation of Presence of Abnormal Lipid Profile in Alsatian Male and Female Exotic Dogs in Vom and Environs

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Abstract: *The lipid profile of Alsatian male and female exotic dogs ages ranging from 1-3 years old was investigated for dyslipidemia. A total of 100 samples were collected comprising 50 males and 50 females. Serum samples were analysed for cholesterol, HDL, LDL and triglycerides using Fortress Reagent Kits. The results obtained were analysed using one way ANOVA. Mean cholesterol, HDL, LDL, and Triglycerides of male Alsatian dogs were 5.1±0.464, 0.9±0.163, 4.2±0.472 and 0.003±0.002 while that of females were 4.6±1.115, 1.1±0.20, 3.5±1.172 and 0.004±0.002 for cholesterol, HDL, LDL and triglycerides respectively. Comparison of mean cholesterol, HDL, and triglycerides between the male and female dogs was found to be significant $p < 0.05$ whereas mean comparison for LDL between the two sexes was not statistically significant $p > 0.05$. Although the results obtained indicated that male Alsatian dogs had higher lipid profile than the females there was no prevalence of abnormally high lipid profile (dyslipidemia) among the dogs examined.*

I. Introduction

The dog (*Canis familiaris*) is a domesticated subspecies of the grey wolf, a member of the canidae family of the order carnivora. The term is used for both feral and pet varieties. The domestic dog has been one of the widely kept walking and companion animal in human history [1].

As a result of domestication process, dogs developed sophisticated intelligence that includes unparalleled social cognition and a simple theory of mind that is important to their interaction with humans. These social skills have helped the dog to perform myriad roles, such as herding, protection and more recently, assist handicapped individuals. Currently, there are estimated to be 400 million dogs in the world [2][3].

Lipids play important role in virtually all aspect of biological life, serving as hormone, hormone precursor, and metabolic fuels and also forming insulation to allow for nerve condition or heat loss prevention [4]. They are naturally occurring compound that are esters of long chain fatty acids, insoluble in water but soluble in organic solvents. It comprises of large number of diverse chemical substances of which the major once are cholesterol, triglycerides, phospholipids and nonesterified fatty acid which are modified and transported in plasma and tissues as lipoprotein [4].

Dyslipidemia is an abnormal amount of lipids (e.g. cholesterol and/or fat) in the blood. In developed countries, most dyslipidemias are hyperlipidemias; that is, an elevation of lipids in the blood. This is often due to diet and lifestyle. Prolonged elevation of insulin levels can also lead to dyslipidemia. Likewise, increased levels of O-GlcNAc transferase (OGT) may cause dyslipidemia.[5][6].

Primary (genetic) causes and secondary (lifestyle and other) causes contribute to dyslipidemias in varying degrees. For example, in familial combined hyperlipidemia, expression may occur only in the presence of significant secondary causes. Primary causes are single or multiple gene mutations that result in either overproduction or defective clearance of TG and LDL cholesterol, or in underproduction or excessive clearance of HDL. The names of many primary disorders reflect an old nomenclature in which lipoproteins were detected and distinguished by how they separated into α (HDL) and β (LDL) bands on electrophoretic gels.[7].

Canine hypertriglyceridemia can be associated with abdominal pain, seizures, diarrhea, vomiting, paralysis, hepatomegaly, splenomegaly, pancreatitis, ocular troubles, cardiovascular dysfunctions, lethargy, and anorexia[8]. Hypercholesterolemic clinical signs are more discreet. Moreover, hyperlipidemia produced intimal fatty lesions in the abdominal aorta and many of its branches and in large and small coronary arteries [9]. At postmortem examinations of a dog with diabetes mellitus, atherosclerotic plaques were observed in the terminal

aorta and in medium-sized arteries including the coronary arteries, renal and arcuate arteries, and arteries of the brain[10]. However, atherosclerosis occurs more rarely than in humans because, in dogs, the HDL/LDL ratio is the inverse of that in humans[11]. Hypertriglyceridemia is one of the most common abnormalities reported in obesity as a result of a VLDL-TG overproduction that could be caused by an increased supply of substrates to the liver, particularly free fatty acids (FFA)[12]. In dogs, the disease severity is directly related to circulating lipid concentrations[5][6].

Aberrations in plasma cholesterol and triglyceride levels are indicative of diseases associated with obesity and diabetes mellitus[13]. Mounting evidences have suggested the increasing recognition of clinical importance of hyperlipidemia in dogs. Hyperlipidemia causes other disorders such as pancreatitis, hypothyroidism[14][15]. However, many of hyperlipidemia dogs physically appear healthy and do not usually exhibit any symptoms.

1.1 Justification

Lipid is one of the important nutritional parameter both in humans and animals (dogs inclusive). However, in most cases dyslipidemic dogs often appear physically healthy and may not usually exhibit any symptoms.

1.2 Aims And Objective

- i. To determine cholesterol, HDL-cholesterol, LDL-cholesterol and triglyceride levels in Alsatian male and female exotic dogs.
- ii. To compare these parameters among the two sexes with view to diagnosing dyslipidemia.

II. Materials And Methods

2.1 Study Subjects

A total of hundred (100) blood samples from 50 males and 50 females of Alsatian healthy and well fed dogs with ages ranging from 1-3 years were collected from two veterinary clinics (N V R I Veterinary Clinic Vom and ECWA Veterinary Clinic Bukuru) in the study area. 5mls blood were collected from each for the study.

2.2 Collection Of Sample

The blood samples were collected by the Veterinary clinician using a needles and syringes and were allowed to clot at room temperature, retracted and centrifuged at 3000rpm for 5minutes to obtain clean sera samples and were analyzed.

2.3 Estimation Of Serum Total Cholesterol

Total serum cholesterol was estimated using the procedure/method provided by the reagent kit's manufacturer (fortress diagnosis for cholesterol).

2.3.1 Protocol

Reagent and samples were brought to room temperature. 1.0ml reagent was added to appropriate labelled tubes: blank, samples and standard. 0.01ml of distilled water, sample and standard were added to blank, sample and standard tubes respectively. It was mixed and incubated for 10 minutes at 37°C and the absorbance was read at 510nm against the blank.

2.3.2 Calculation

Total cholesterol = $\frac{\text{OD of test} \times \text{concentration of standard (mg/dl)}}{\text{OD of standard}}$

2.4 Estimation Of Serum Triglycerides

Triglyceride was estimated according to the procedure provided by the reagent kit's manufacturer (Fortress diagnostic for cholesterol).

2.4.1 Protocol

1.0ml of reagent was added to appropriately labelled tubes: blank, standard and samples were added to blank, standard and samples tubes respectively. They were mixed and incubated for 10minutes at 37°C and the absorbance was read at 510nm using the blank to zero the colorimeter.

2.4.2 Calculation

Total triglyceride = $\frac{\text{OD of test} \times \text{concentration of standard (mg/dl)}}{\text{OD of standard}}$

2.5 Estimation Of Serum Hdl-Cholesterol

This was determined using fortress diagnostic precipitant. This was done by precipitation method as describe by Lopez-Vinella et al., (1977).

2.5.1 Protocol

Stage 1: 0.2ml of the precipitant was added to 0.2ml of the serum sample and was mixed properly. It was then centrifuged at 4000rpm for 10 minutes.

Stage 2: The supernatant was then subjected to the same procedure as same procedure in total cholesterol estimation.

2.5.2 Calculation

$$\text{Total HDL} = \frac{\text{OD of test} \times \text{concentration of standard (mg/dl)}}{\text{OD of standard}}$$

2.6 Determiation Of Serum Ldl-Cholesterol

This is estimated by the method of Friedewald et al. (1972). Low density lipoprotein (LDL) cholesterol is calculated from primary measurement by the use of the empirical equation.

$$\text{LDL Cholesterol} = \text{Total cholesterol} - (\text{HDL} + \text{TG})$$

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III. Result

Table 1: Shows mean and standard deviation of total cholesterol, HDL, LDL and triglyceride of male exotic breeds

Biochemical parameter	No. of sample	mean±Std
Cholesterol	50	5.1±0.464
HDL		0.9±0.163
LDL		4.2±0.472
Triglyceride		0.003±0.002

Table 2: Shows mean and standard deviation of total cholesterol, HDL, LDL and triglyceride of female exotic breeds

Biochemical parameter	No. of sample	mean±Std
Cholesterol	50	4.6±1.115
HDL		1.1±0.20
LDL		3.5±1.172
Triglyceride		0.004±0.002

Table 3: Mean comparison of male and female exotic breeds for cholesterol, HDL, LDL and triglyceride

Parameter	Male	Female	Difference	P. value	Remark
Cholesterol	5.12	4.58	0.54	<0.05	Significant
HDL	0.93	1.10	-0.17	<0.05	Significant
LDL	4.19	3.48	0.71	>0.05	insgnificant
Triglyceride	0.003	0.004	-0.001	<0.05	Significant

IV. Discussion

The dogs admitted for this study were brought to the clinic for normal clean ups and checkups as well routine laboratory analysis where they were selected by rigorous clinical examination and as such obese or badly nourished animals were not admitted to the study, neither animals suspected of any disease as hypo or hyperthyroidism or under any pharmacological treatment which can alter lipid profile, and all animals were consuming a standard commercial diet.

The mean cholesterol, HDL, LDL and triglyceride levels of male Alsatian dog were 5.1±0.464, 0.9±0.163, 4.2±0.472 and 0.003±0.002 table 1. These values are found to be within normal ranges reported in various literatures as report by José Henry Osorio (2009)

Also the mean cholesterol, HDL, LDL, and triglyceride levels of the female Alsatian were 4.6±1.115, 1.1±0.20, 3.5±1.172, and 0.004±0.002 table 2. These also fell within the reference ranges reported in most literatures. However the total cholesterol and LDL cholesterol of the male were higher than those of the female whereas the HDL-cholesterol and triglyceride level were higher in the female than the male. This may be explained based on the individual differences in response to diet intake as well as genetic factors also report

by [16]. Another reason may be due to differences in some metabolic activities *vis-a-vis* : absorption, distribution and elimination of the waste product from food as observed in a report by [17].

Furthermore mean comparison of cholesterol, HDL, and triglyceride of male and female Alsatian dogs investigated shows significant difference ($P < 0.05$) table 3. However comparison of the mean LDL cholesterol of male and female Alsatian indicated no significant difference ($P > 0.05$). This is not surprising, because in a laboratory analysis of the serum cholesterol and lipid carried out by [18] plasma, cholesterol and other lipid showed difference in their activity in sixteen vertebrate species of dogs.

Also dogs do not necessarily require more lipid or fat containing diet, instead it must be given along with other nutritional diets like protein and carbohydrate as balance diet to maintain a good and healthy life for dogs [19][20].

In humans, and possibly in animals, severe hyperlipidemia can result from hereditary factors working in concert with one or more acquired conditions. Ultimately, hyperlipidemia results from excessive dietary intake of lipids, excessive endogenous production or mobilization of lipids, ineffective clearance of lipids from the blood, or combinations of these [9]. Because VLDL-TG synthesis is stimulated by the influx of fatty acids into the liver, the mobilization of body fat stores can cause hypertriglyceridemia. Furthermore, because normal clearance of VLDL triglycerides from the blood requires the action of lipoprotein lipase, a decreased activity of this enzyme may also be responsible for hypertriglyceridemia [5].

Since these dogs are exotic breeds, genetically, they may not be the same in their response to food intake or nutrients, hence their differences in statistical analysis as observed by [20].

Dog breeds and its relationship with cardiovascular variables and disease have been shown by [21] and dyslipidemia has been shown to be one of the most potent risk factors for coronary heart disease (CHD) [22][23].

V. Conclusion

Lipid profile has been shown to be one of the important predictors of metabolic disturbance, and since dog and human are related in their diet intake, high lipid content may lead to cardiovascular problems.

VI. Recommendation

We recommend that lipid profile of exotic dogs be checked routinely to prevent them from developing cardiovascular diseases.

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