Serum glucose concentration and lipid profile in racing horses

S. A. Hasso, H. A. Al-Hadithy and R. M. Hameed*

Department of Veterinary Internal and Preventive Medicine, College of Veterinary Medicine, University of Baghdad, *Adan Veterinary Clinic, Baghdad, Iraq

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Abstract

The aim of the present work was to evaluate serum glucose concentration and lipid profile in racing horses in Iraq. Blood samples were collected from the jugular vein of 92 clinically healthy racing horses (males and females, Arabian and Cross bred), 2-8 years old at Equestrian Club, Baghdad. Investigations included serum measurements of glucose (sg) and lipid profile parameters; total cholesterol (TC), Triglyceride (TG), high density lipoprotein- cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C), very low density lipoprotein-cholesterol (VLDL-C) and the atherogenic ratio (LDL-C/HDL-C), in order to register the normal ranges and mean values of these measured parameters in Iraqi healthy racing horses. Results showed that the range and mean values ± standard error of sg were: 33.3 – 6.71 mmol/l and 5.17±0.07 mmol/l, respectively, whereas the TC was 2.07 – 4.22 mmol/l and 3.01±0.05 mmol/l, TG 0.6 – 1.47 mmol/l and 1.06±0.02 mmol/l, HDL-C 0.93 – 2.25 mmol/l and 1.50±0.03 mmol/l, LDL-C 0.10 – 2.12 mmol/l and 0.91±0.04 mmol/l, VLDL-C 0.31 -0.67 mmol/l and 0.55±0.02 mmol/l, respectively and the atherogenic ratio 0.66±0.03. The data present reference values and mean ± SE for sg and lipid profile parameters in healthy racing horses in Baghdad.

Keywords: Iraqi racing horses, Lipid profile tests, Glucose.
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تركيز كلوكوز المصل والصورة الدهنية في خيول السباق

سليم امين حسو، حارث عبد الهادي الحديثي و راسمة مجيد حميد*

فرع الطب الباطني والوقائي البيطري، كلية الطب البيطري، جامعة بغداد، *المستشفى البيطري، ساحة عدن، بغداد، العراق

الخلاصة

كان الهدف من هذه الدراسة هو تقييم مستوى الكلوكوز ومعايير الصورة الدهنية في خيول السباق في بغداد / العراق. تم جمع عينات دم من الوريد الوداجي من 92 حصان من خيول السباق السوية سريريا (ذكور واناث، عربية ومضربة) تراوحت اعمارها بين 2 - 8 سنوات من نادي الفروسية/ بغداد. اشتملت الفحوصات السريرية على قياس مستوى الكلوكوز في المصل اضافة الى قياس معايير الصورة الدهنية متمثلة بالكوليسترول الكلي، الدهون الثلاثية ومستوى كل من الكوليسترول-البروتينات الدهنية العالية الكثافة، الكوليسترول-البروتينات الواطئة الكثافة والكوليسترول-البروتينات الدهنية الواطئة الكثافة جدا ونسبة تصلب الشرايين وذلك لغرض تثبيت قيم هذه المعايير في خيول السباق العراقية. اظهرت النتائج ان قيم المدى والمعدل± الخطأ القياسي الطبيعية لتلك المعايير كانت كما يلي: الكلوكوز 6.71 – 3.3 مل مول/لتر و 5.17±0.07 مل مول/لتر على التوالي، الكوليسترول الكلي 4.22 – 2.07 مل مول/لتر و 3.01±0.05 مل مول/لتر، والدهون الثلاثية 1.47 – 0.6 مل مول/لتر و 1.06±0.02 مل مول/لتر، الكوليسترول-البروتينات الدهنية العالية الكثافة 2.25 – 0.93 مل مول / لتر و 1.50±0.03مل مول/لتر، الكوليسترول-البروتينات الدهنية الواطئة الكثافة 2.12 – 0.1 مل مول / لتر و 0.91±0.04 مل مول/لتر، الكوليسترول-البروتينات الدهنية الواطئة الكثافة جدا 0.67 – 0.31 مل مول / لتر و 0.55±0.02 مل مول/لتر على التوالي، ونسبة تصلب الشرايين 0.66±0.03.

Introduction

Reference hematological and serum biochemical values in horses are needed in order to compare with abnormal value, which are indicative of a disease condition. Arsalan and Al-Saad (1) suspected diabetes mellitus in horses which was confirmed by laboratory investigation, also Dankel and McKenzie (2) confirmed hypertriglyceridemia in clinically ill horses.

Some references values for specific breeds or countries have been stated. Afifi *et al* (3) estimated the cholesterol of Arabian horses in Egypt, Lumsden *et al* (4) estimated many values of the light horse in Canada, Dierenfrld *et al* (5) estimated some lipid levels in Przewalski horses, Arsalan and Al-Saad (1) estimated the glucose and cholesterol in few horses in Iraq. Nazifi *et al* (6) measured serum lipid and lipoproteins in caspain miniature horses in Iran, Asadi *et al* (7) measured the serum lipid and lipoprotein in Turkman horses.

Many of the above mentioned studies were conducted on less than twenty horses; therefore, this investigation was carried out on a larger number to measure some of the biochemical values including serum glucose and lipid profile parameters which have been not previously measured in clinically healthy racing horses in Baghdad.

Materials and Methods

Blood samples were collected into plain tubes by jugular vein puncture of 92 clinically healthy racing horses, 31 males and 61 females, among these animals 26 were Arabian and 66 Crossbred, aged 2-8 years from equestrian club/Baghdad. Serum was separated after centrifugation for 5 minutes at 3000 rpm. The sera were used directly for measurement of sg, TC, TG, HDL-C, LDL-C, VLDL-C and atherogenic ratio LDL-C/HDL-C. Serum glucose was determined according to the enzymatic colorimetric method of (8). TC was measured by the enzymatic colorimetric method of (9).TG was determined by an enzymatic method (10). Serum HDL-C was assayed using an enzymatic method (11). Serum LDL-C was estimated by using the formula of (12). Serum VLDL-C was calculated using the formula TG/5(mg/dl or TG/2.22 m mol/l). Atherogenic ratio was calculated by dividing the LDL–C by HDL–C (13).

Data were subjected to analysis of variance and significance means were compared by t-test at the level of ($P<0.05$) (14).

Results

The serum values of the measured parameters for the horses independent of any subdivision are presented in table 1.

Table 1: Range and mean ± SE of some serum values for Iraqi racing horses

Parameters		n	Range	Mean± SE
SG	mmol/l	92	3.3-6.71	5.17±0.07
	mg/dl		60-121	93.15±1.26
TC	mmol/l	92	2.07-4.22	3.01±0.05
	mg/dl		80-163	116.22±1.93
TG	mmol/l	92	0.60-1.47	1.06±0.02
	mg/dl		53-130	93.81±1.77
HDL-C	mmol/l	89	0.93-2.25	1.50±0.03
	mg/dl		36-87	57.92±0.03
LDL-C	mmol/l	89	0.10-2.12	0.91±0.04
	mg/dl		4-82	35±1.54
VLDL-C	mmol/l	91	0.31-0.67	0.55±0.02
	mg/dl		12-26	21.24±0.02
Atherogenic ratio		89	0.20-2.05	0.66±0.03

The values in table (2) are presented according to the following factors: breed, sex and age, respectively and the atherogenic ratio with related number of horses for each factor. The Mean (± SE) values of sg and lipid profile parameters including serum TC, TG, HDL-C, LDL-C, VLDL-C and atherognic ratio did not differ significantly between males and females, Arabian and crossbred racing horses (Table 2). Moreover the age of racing horses found to have no effect on sg and lipid profile parameters values, as there were no significant differences between horses of age 5 years, less than 5 and more than 5 (Table 2).

Discussion

The values presented were obtained from clinically normal and healthy racing horses in order to provide the lower and upper limits for that specific animal and population. To our knowledge there were no previous range reference values in racing horses in Iraq, so our results were compared with available reference values. The lower range of sg was lower than those mentioned by (4,15), while the upper range was very close to (4,15), also the mean sg values was close to (1). The differences could be attributed to the type of feeding program and the exercise of racing horses which need glucose consumption for energy (16).

The TC ranged between 2.07-4.22 mmol/l and was near the ranges mentioned earlier (4,15). Nazif (6) mentioned a higher TC value in horses above 5 years old (5.07± 0.33 mmol/l). Asad (7) mentioned a higher level of TC in males than in females. Others (1,3) recorded values in the same ranges of this study which were between 2.07-4.22 mmol/l.

TG values reported by others (5-7) did not agree with our results and were lower than the lowest ranges or means of this study. As with the differences in the TG, differences in the HDL-C, LDL-C and VLDL-C existed. According to (6) the HDL-C values in the three age groups were lower

than the means of the age groups of this study, while the means of the LDL-C were higher in his age groups as compared with the values of the age groups of this study, and also contrary to the values of the means of the VLDL-C which were lower than the values of this investigation. The atherogenic ratio was mentioned as absolute numbers and not compared with other researches due to the absences of a similar work.

This investigation did not detect significant differences between breeds, sexes and ages. The 5 years age group had higher values of TC, TG and VLDL-C than horses of less and more than 5 years age groups. Further study is required to examine these differences. Differences in lipid profile in this study as compared with results of other workers may be attributed to factors such as: absence of scientifically feeding program, living in hot areas, adaptation of Arabian horses for the local climate, genetic factor and training (16,17).

Table 2: Serum biochemical values in racing horses according to breed, sex and age factors.

Factors	n	Parameters						
		Sg mmol/l mg/dl	TC mmol/l mg/dl	TG mmol/l mg/dl	HDL mmol/l mg/dl	LDL mmol/l mg/dl	VLDL mmoll/l mg/dl	Ather. ratio
Arabian	26	5.32±0.19 95.86±2.52	3.01±0.09 116.22±3.47	1.11±0.05 98.23±4.42	1.57±0.06 60.62±2.32	0.92±0.09 35.52±3.42	0.52±0.02 20.68±0.77	0.59±0.07
Cross bred	66	5.11±0.09 92.07±1.62	3.02±0.06 116.60±2.32	1.03±0.03 91.15±2.65	1.48±0.03 57.14±1.16	0.90±0.04 34.75±1.54	0.57±0.03 22.01±1.16	0.69±0.04
males	31	5.35±0.13 96.40±2.32	3.02±0.08 116.60±3.04	1.07±0.04 94.69±3.54	1.55±0.05 59.85±1.93	0.93±0.07 35.9±2.70	0.53±0.03 20.46±1.16	0.65±0.05
females	61	5.08±0.09 91.53±1.63	3.01±0.06 116.22±2.32	1.05±0.03 92.92±2.65	1.48±0.03 57.14±1.16	0.90±0.05 34.75±1.93	0.57±0.04 22.01±1.54	0.67±0.04
Less than 5 years	48	5.13±0.11 92.43±1.98	2.97±0.06 114.67±2.32	1.03±0.03 91.15±2.65	1.47±0.04 59.76±1.54	0.93±0.05 35.91±1.93	0.53±0.03 20.46±1.16	0.69±0.05
5 years	27	5.22±0.15 94.05±2.70	3.14±0.10 121.24±3.86	1.13±0.05 100±4.42	1.54±0.06 59.46±2.32	0.89±0.08 34.62±3.09	0.63±0.06 24.32±2.32	0.68±0.07
More than 5 years	17	5.20±0.17 93.69±3.06	2.94±0.1 113.51±3.86	1.00±0.07 88.50±6.19	1.53±0.06 59.07±2.32	0.90±0.10 34.75±3.86	0.52±0.06 20.08±2.32	0.57±0.06

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