

## Study on Hyperlipidemia in Donkeys with Special Reference to Its Therapeutic Approach And Ameliorative Measures in And Around Gondar Town

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**Abstract:** Hyperlipidemia is the presence of elevated lipid concentrations in the blood and it is associated with many predisposing factors. Clinical field trial was conducted from January 2017 to April, 2018, to determine the most effective therapeutics for treatment of hyperlipidemia in donkeys by ensuring the efficacy of different concentrations and combination of dextrose. For this study, 15 adult male donkeys were selected in the study area, after performing tentative diagnosis, screening test and confirming by laboratory biochemical tests. Randomly assigned 15 animals in the first, second, third and fourth groups with equal number of 3 were subjected to treatment with dextrose 5% plus prednisolone 5mg, dextrose 5%, dextrose 10% and dextrose 20% respectively and the fifth group was positive control. Blood samples were collected from jugular vein of donkeys, before and after treatment. Hemoglobin concentration, packed cell volume, white blood cells and red blood cells count were evaluated using automated hemoanalyzer in all selected animals. Plasma was tested for total proteins, albumin, triglycerides (TG), total cholesterol, ALT, AST activity and glucose level. Heart rate, respiratory rate and rectal temperature were also evaluated. General health of animals and abnormal clinical signs were recorded daily. ANOVA was used to test the efficacy of dextrose between and within groups and paired t-test were used to test efficacy of dextrose before and after treatment. When animals were hyperlipidemic significantly increased of mean plasma ALT, AST, Triglyceride (TG) and total cholesterol level were observed and significantly decreased in total protein, glucose and albumin, when compared with normal baseline values. But when animals were treated with dextrose intravenously in different concentrations and combination, especially diseased animals were treated with dextrose 5% plus prednisolone 5mg, the plasma ALT, AST, Triglyceride (TG) and total cholesterol level were significantly decreased to normal level and total protein, glucose and albumin, increased significantly to normal values. Diseased animals which were treated with dextrose 5% alone had a good response next to its combination with prednisolone. Diseased animals were treated with dextrose 10% and 20% had no significant change and the better drug (dextrose 5% plus prednisolone 5mg) recommended to government and private veterinary practitioners for the treatment of hyperlipidemia disease conditions.

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**Key words:** *Ameliorative measures, donkey, hyperlipidemia and therapeutic regimens*

### Introduction

The equine population of the world is currently estimated to be 112.5 million of which, 44.3, million are donkeys 58.5 million are horses and the rest are mules. Ethiopia has the largest population of equines in Africa and the second largest equine population in the world next to China, by possessing 2.08 million horses, 7.88 million donkeys and 0.41 million mules (CSA, 2016). Also the country possesses approximately half of Africa's equine population with 37% donkeys, 58% horses and 46% mules (CSA, 2007). Equines are important animals to the resource poor communities, providing traction power and transport services at low cost and in the remote areas of Ethiopia (Biffa and Woldemeskel, 2006).

Despite their invaluable contributions, equines in Ethiopia are the most neglected animals, accorded low social status, particularly the male working equines. Donkeys involved in pulling carts often work continuously for 6 to 7 hours per day, carrying (260-500 kg) in single trip (Biffa and Woldemeskel, 2006). They are provided with wheat bran and cereal straw by moistening with water and grasses where season provide on access during the night and allowed to graze pasture and road side in the town fringe during the day. Feed shortage and diseases like hyperlipidemia are the major constraints to the productivity and work performance of donkeys (Mengistu, 2003).

Hyperlipidemia is a condition when abnormally high levels of lipids i.e. the fatty substances are found in the blood. This condition is also called hypercholesterolemia or hypertriglyceridemia. Lipid abnormality is a prognostic indication of increased morbidity and mortality connected with various pathological conditions. Study showed that hypercholesterolemia induce lower total T-cells, CD8, CD4 and lower productivity of interleukin-2 which is crucial to combat various diseases. Any undesirable change will disturb the balance resulting in diseased state. The lipid alteration is a cause for subsequent development of other diseases like dyslipidemia so change in serum lipids levels are associated with different diseases (Amarenco and Labereuche, 2009).

Disturbances of lipid metabolism that result in accumulation of triglycerides in the blood are common in equine species. Hyperlipidemia is a pathophysiological response to prolonged negative energy balance associated with gross lipemia. Hyperlipidemia in equine has been thoroughly reviewed elsewhere. The disease is well described in donkeys with mortality from 86% to 95%, higher than that in ponies. In ponies and donkeys hyperlipidemia is usually a primary disease process and stress and obesity appear to be particularly important predisposing factors. Off feed, either accidental or intentional or relative to the increased metabolic demands of pregnancy or lactation; is a common predisposing factor in primary and secondary hyperlipidemia (Bulldan *et al.*, 2013).

Arteries are normally smooth and unobstructed on the inside, but in case of increased lipid level, a sticky substance called plaque is formed inside the walls of arteries. This leads to reduced blood flow, leading to stiffening and narrowing of the arteries. It has been proved that elevated plasma levels of cholesterol and LDL are responsible for atherosclerosis in animal, and epidemiological data suggests that elevated plasma levels of HDL have a protective effect. Extensive amount of reduced feed intake, stress, age, gender, genetics and the high rate of diseases that tend to increase LDL blood levels and kidney and liver diseases are also considered as the main risk factors of hyperlipidemia occurrence (Niharika, 2017).

The main pathological symptoms of animal with hyperlipidemia are continuous weight loss, dullness, depression, anorexia, weakness, emaciation, but the mechanisms involved are poorly understood (Bulldan *et al.*, 2013). To determine if hyperlipidemia is involving in the current medical problem, serum triglyceride levels need to be measured. Plasma or serum triglycerides higher than normal value confirm the diagnosis (Ridker *et al.*, 2010). The postmortem finding of hyperlipidemia in the liver and kidneys are

often pale, swollen, and friable with a greasy texture (Pratt *et al.*, 2006).

The most effective preventive approach is to avoid situations of stress and negative energy balance in animals likely to be susceptible to hyperlipidemia (Cole, 2009). Good management needs that clinicians identify the affected animals as early as possible to institute therapy before the hypertriglyceridemia becomes severe. The first goal of surveillance is recognition of animals at risk by identifying the causing factors for hyperlipidemia. If there is a lack of voluntary intake in a patient, capable of tolerating enteral nutrition, then enteral supplementation is indicated. If the enteral route is unavailable, parenteral nutritional (PN) support is required. So, of all the strategies used in the control of hyperlipidemia, chemotherapy is the most widely used, more effective, and more accepted means of control (Wyse *et al.*, 2008).

Losses from hyperlipidemia in Ethiopia could be significant, due to the multiple functions of donkeys in the smallholder farming systems and empirical estimation of hyperlipidemia, about such losses are still scarce. However, donkeys which are developing hyperlipidemia result in donkeys losing more than 10 kg body weight in the month before the onset of illness. Hyperlipidemia is a life threatening condition in horses, ponies, and donkeys. If left undetected or untreated, hyperlipidemia may progress to hepatic lipidosis and liver failure with multi systemic complications. And it is obvious that the cause of lipid lipolysis in off feed or fasting animal is shortage of glucose in the bloodstream, so the assessment of lipid profile with therapeutic of dextrose is crucial, thus recognizing disease's best treatment and ameliorative measure were essential to generate baseline information about the disease therapy and its impact (Admassu and Shiferaw, 2011).

Therefore, the general objective of this study is: to compare the efficacy of different dextrose concentration and its combination with other drug with focus on hyperlipidemic donkey treatment in and around Gondar. And the specific objectives are: to determine the most effective therapeutics for treatment of hyperlipidemic condition and to describe the preventive and ameliorative measures of hyperlipidemia in donkeys as technology transfer to field veterinarians and private practitioners for animals.

## Material And Methods

### Ethical approval:

The study protocol was approved by the College of Veterinary Medicine and Animal science Research Board as well as the Deanship of Scientific Research, Gondar University of Science and Institute.

### Study Area:

The study was conducted in and around Gondar, in Amhara National Regional State, located in the northwestern part of Ethiopia. The donkey population of Gondar zone was estimated 376,841 (CSA, 2016). The present study were carried out in donkeys which were coming to Gondar University veterinary clinics, Gondar town veterinary clinics and Azezo veterinary clinic on the symptom of complete loss of appetite with history of stress, continuous weight loss and overloading of animals in study area were selected for further diagnoses.

#### **Study animals**

Animals used for the study were those donkeys showing suspected clinical signs of hyperlipidemia, which were coming to Gondar University, Gondar town veterinary clinics and Azezo veterinary clinics. The study animal comprises of fifteen donkeys all were adult and male that had history of heavy overload, stress and show clinical signs of complete loss feed, dullness and continuous loss of weight in the study areas.

#### **Method of selection of study animals**

In addition to suspected clinical sign of hyperlipidemia, further laboratory works were done to confirm whether the tentative diagnosis of hyperlipidemia in donkey is the actual hyperlipidemia in donkey or not. For this 5ml of blood was taken with EDTA coated tube and the color of blood plasma from donkeys with hyperlipidemic condition were changed to yellowish cloudy (fatty) after centrifugation. Biochemical parameters were measured and taken as the confirmatory diagnoses.

#### **Sampling Strategy and Sample Size Determination**

A total of fifteen donkeys with suspected clinical signs of the disease and those which pass the screening test and biochemical test were sampled purposively. The blood sample was taken with EDTA coated tube and observe the turbidity of plasma or the color of blood plasma from donkeys with hyperlipidemic condition were changed after centrifugation.

#### **Study Design**

Clinical field trial study design were conducted from January, 2017 to April, 2018 to compare the effectiveness of the four treatment groups (Group I, II, III, and IV) with respective concentrations of dextrose 5% plus prednisolone, dextrose 5% alone, dextrose 10% and dextrose 20% to the clinically and biochemically hyperlipidemic donkeys.

#### **Sample Collection and Laboratory Measurements**

**Blood samples:** Five ml of blood were collected from jugular vein before and after treatment, with EDTA coated vacutenier tubes and the sample were kept immediately in ice box for transport to Gondar University veterinary clinical pathology laboratory and whole blood were used for hematological test. Whole blood and plasma were separated for biochemical test

after centrifugation. Hematological and biochemical parameters were evaluated before and after treatment in each group and interpretation with conclusion were made on the basis of both findings.

To extract plasma from the whole blood: the whole blood was placed in EDTA tube. Centrifuge at 2000 revolution per minute for 10 minutes. Plasma layer was removed and stored in ice then transfer to refrigerator for further investigation. The disturbing white buffy coat layers were avoided. Aliquot samples for testing were stored in deep freezing.

#### **Hematological parameters:**

Haemoglobin estimation (Hgb %), packed cell volume (PCV), total red blood cell count (TRBC) and white blood cells (WBCs), were measured using automated hemoanalyzer.

#### **Biochemical parameters**

Concentrations of plasma triglyceride (TG) and total cholesterol were measured using the enzymatic colorimetric reagents. Triglycerides/cholesterol enzymatic assay kit is a simple, direct and automation compatible method for measuring triglyceride/cholesterol levels in plasma samples. Plasma total protein, albumin, blood glucose, AST (SGOT), and ALT (SGPT) activity level were measured using a vitro enzymatic colorimetric test kit.

#### **Clinical parameters:**

Respiratory rate, heart rate and rectal temperature were measured using standard methods

#### **Selection of Treatment Group**

Following selection of hyperlipidemic donkeys based on suspected clinical sign, screening test and conformation of biochemical test, animals were randomly divided in to five groups consisting three donkeys in each group. Animal in the first group were subjected to treatment with Dextrose 5% at the rate of 10ml / kg I/V with Prednisolone 0.2mg/kg body weight daily for 3 days, animals in the second group were subjected to treatment with Dextrose 5%, 10ml / kg I/V for 3days, animals in the third group were subjected to treatment with Dextrose 10 %, 10ml / kg I/V for 3days, animals in the fourth group were subjected to treatment with Dextrose 20%, 10ml / kg I/V for 3days and animals in the fifth group were not subjected for treatment (sick/positive control).

#### **Data Statistical Analysis**

Data entry and management were made using Microsoft Excel sheets. Data analysis were made by using Statistical Package for Social Science (SPSS 2007 version 20) software. One-way ANOVA test were used to compare the mean difference of triglyceride, cholesterol, protein, albumin and glucose level among the different four treatment groups. Paired t-test was used to compare effect of treatment on hyperlipidemic changes in donkeys before and after treatments.

**Results**

**Clinical signs:** All the hyperlipidemic donkeys showed the clinical sign of dullness, depression, anorexia, weakness, emaciation, rough hair coat, continuous weight loss, lethargy and poor body condition due to stress, negative energy balance and overloading of animal.

**Physiological parameters:** Among physiological parameters heart rate and respiratory

rate were significantly changed in all four treatment groups ( $p < 0.05$ ) as shown in table 1. In all four treatment groups there was no significant ( $P > 0.05$ ) change in rectal temperature, it was fluctuating within the normal range observed between before and after treatment period (Table-1, 2 and 3 were drawn using paired-t test).

Table 1: Effect of treatment on physiological parameters

Parameters	Dextrose 5 %+ Prednisolone 5mg			Dextrose 5% alone		
	Before Rx	After Rx	p- value	Before Rx	After Rx	p- value
Temp (°c)	38.7 ± 0.52	38.03±0.2	0.0695	38.53±0.15	38.2±0.3	0.0648
HR/min	44.66±1.52	37.33±2.08	0.0292	42.67±1.527	33.67±4.72	0.0300
RR/min	29 ±1	16.33±1.523	0.0003	24.33±2.08	17.67±0.60	0.0222
Parameters	Dextrose 10 % alone			Dextrose 20 % alone		
	Before Rx	After Rx	p- value	Before Rx	After Rx	p- value
Temp (°c)	38.86± 0.20	38.33±0.47	0.0784	38.43±0.50	38.3±0.5	0.0572
HR/min	44 ±1	38.67±2.08	0.0334	41.67±3.21	35.33±4.163	0.0445
RR/min	23.67±1.527	17.67±0.57	0.0267	23±1	21.67±1.154	0.0286

HR/min=heart rate/minute, Rx=treatment and RR/min= respiratory rate/minute

The overall mean physiological parametric changes observed in all diseased animals during the study period, before and after treatments were summarized in bar graph (figure 1). There were

significant changes in heart rate and respiratory rate among all treatment groups as compared to positive control group as shown in figure 1.

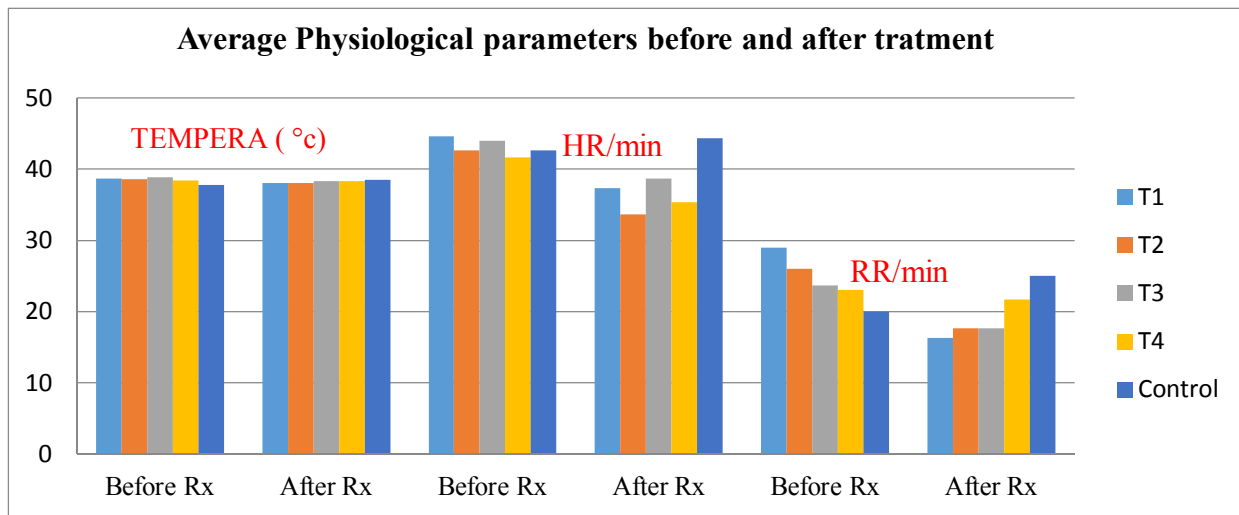


Figure 1: The Mean physiological parameter values measured during the study period in four treatment groups and control group before and after treatment

**Hematological parameters:** in this study in all treatment groups there was significantly ( $P < 0.05$ ) decreased in PCV and significant ( $P < 0.05$ ) increased in Hbg and TRBC after treatment given, except WBC

in the first treatment group, this is due to anti-inflammatory activity of prednisolone drug as shown table 2.

Table 2: Effect of treatment on hematological parameters

Parameters	Dextrose 5 %+ Prednisolone 5mg			Dextrose 5% alone		
	Before Rx	After Rx	p- value	Before Rx	After Rx	p- value
PCV (%)	28.33±1.266	19.35±0.68	0.0007	32.67±2.08	18.53±0.65	0.0018
Hgb (g/dl)	8.80±0.499	13.56±2.211	0.0134	8.6±0.699	10.67±0.47	0.0451
TRBC (mm <sup>3</sup> )	6.1±1	14.1±2.15	0.0240	6.96±0.152	8.63±0.642	0.0267
WBC (mm <sup>3</sup> )	19.267±1.457	21.167±1.36	0.129	20.1±1.0	25.2±0.458	0.0039
Parameters	Dextrose 10 % alone			Dextrose 20 % alone		
	Before Rx	After Rx	p- value	Before Rx	After Rx	p- value
PCV (%)	34.33±2.08	19.46±0.85	0.0059	37.66±1.52	17.33±0.25	0.0008
Hgb (g/dl)	9.27±0.208	12.67±2.15	0.0480	8.83±0.305	9.3±0.529	0.0590
TRBC (mm <sup>3</sup> )	6.83±0.30	7.5±0.360	0.0348	7.3±0.72	7.8±0.655	0.0410
WBC (mm <sup>3</sup> )	19.36±1.20	22.46±0.650	0.0151	20.52±1.0	21.86±0.21	0.0519

The overall mean hematological changes observed in all diseased animals during the study period, before and after treatments were summarized in bar graph (figure 2). There were significant

increased and decreased, in all hematological parameter counts were detected, except WBC in the first treatment group as shown in figure 2.

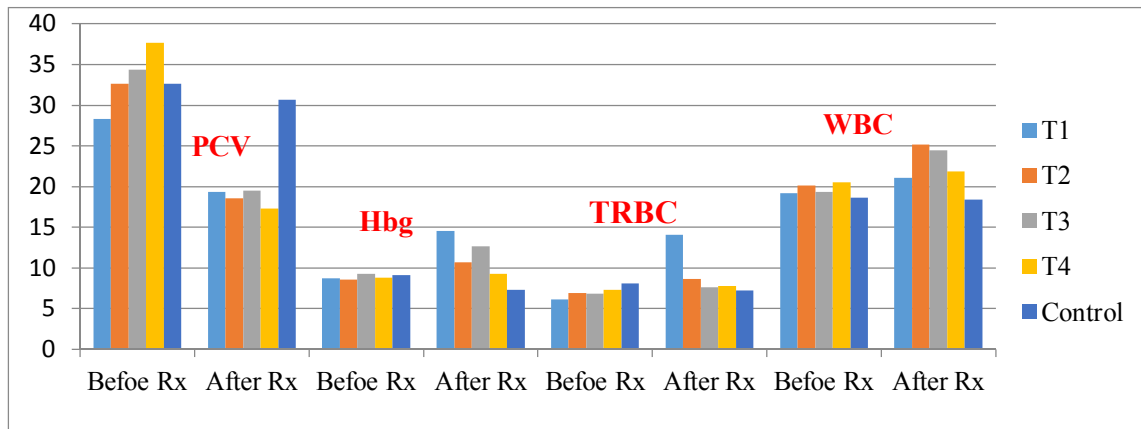


Figure 2: The Mean hematological parameter value measured during the study period in four treatment groups and control group before and after treatment

**Biochemical parameters:** Triglyceride (TG), Cholesterol, AST and ALT, were significantly (P<0.05), decreased, in the first and second treatment groups and accordingly in the rest treatment groups. Total protein and Albumin were significant (P<0.05) increased from abnormally decreased level of protein

and albumin concentration after treatment was given. **Glucose:-**There was significant (P<0.05) increase in the level of glucose concentration in hypoglycemic animals in the first, second, third and forth treatment groups after treatment, as shown in table (3).

Table 3: Effect of treatment on biochemical parameters

Parameters	Dextrose 5 %+ Prednisolone 5mg			Dextrose 5% alone		
	Before Rx	After Rx	p- value	Before Rx	After Rx	p- value
Triglyceride (mg/dl)	332.25±24.84	100.033±15.3	0.0006	247.83±61.4	127.06±25.5	0.0175
Cholesterol (mg/dl)	344.13±45.5	116.71±23.58	0.0136	213.33±6.92	173.9±13.91	0.0368
Total protein (g/dl)	4.32±1.32	7.7±1.21	0.0013	5.5±0.264	9.5±0.793	0.0113
Albumin (g/dl)	1.953±0.096	4.5±1.0	0.0214	1.86±0.29	3.10±0.87	0.0409
ALT/SGPT (IU)	40.3±18.19	3.7±2.00	0.0356	14.2± 1.24	9.26±1.66	0.0357
AST/SGOT (IU)	45.93±22.39	6±2.60	0.0479	54.61±9.574	19.96±12.96	0.0537
Glucose (mg/dl)	31.47±8.54	78±8.928	0.0213	37.4±4.50	55.86±4.79	0.0346

Parameters	Dextrose 10 % alone			Dextrose 20 % alone		
	Before Rx	After Rx	p- value	Before Rx	After Rx	p- value
Triglyceride (mg/dl)	215.6±15.16	182.7±10.75	0.0467	212.1 ±16.5	188.2 ±2.6	0.0539
Cholesterol (mg/dl)	231.13±21.67	133.43±66.27	0.0502	215.63±7.87	173.3±25.38	0.0578
Total protein (g/dl)	4.37±0.80	7.5±1.3	0.0246	4.93±0.288	6.62±0.771	0.0279
Albumin (g/dl)	2.2±0.1	3.9±0.96	0.0454	2.73±0.20	3.57±0.568	0.0498
ALT/SGPT (IU)	9.23± 2.79	6.2±5.96	0.0417	22.33±8.03	8.6±2.47	0.0500
AST/SGOT (IU)	12.06±2.8	7.73±3.52	0.0881	16.96±6.83	10.26±1.193	0.0883
Glucose (mg/dl)	37.73±2.35	44.66±1.70	0.0458	40.5±4.635	44.2±2.605	0.0489

The overall mean biochemical parametric changes observed in all diseased animals during the study period, before and after treatments were summarized in line graph (figure 3). Significant decreased of mean value of triglyceride, total

cholesterol, ALT and AST were observed while significant increased mean value of glucose, total protein and albumin were observed after treatment when compared with control group as shown in figure 3.

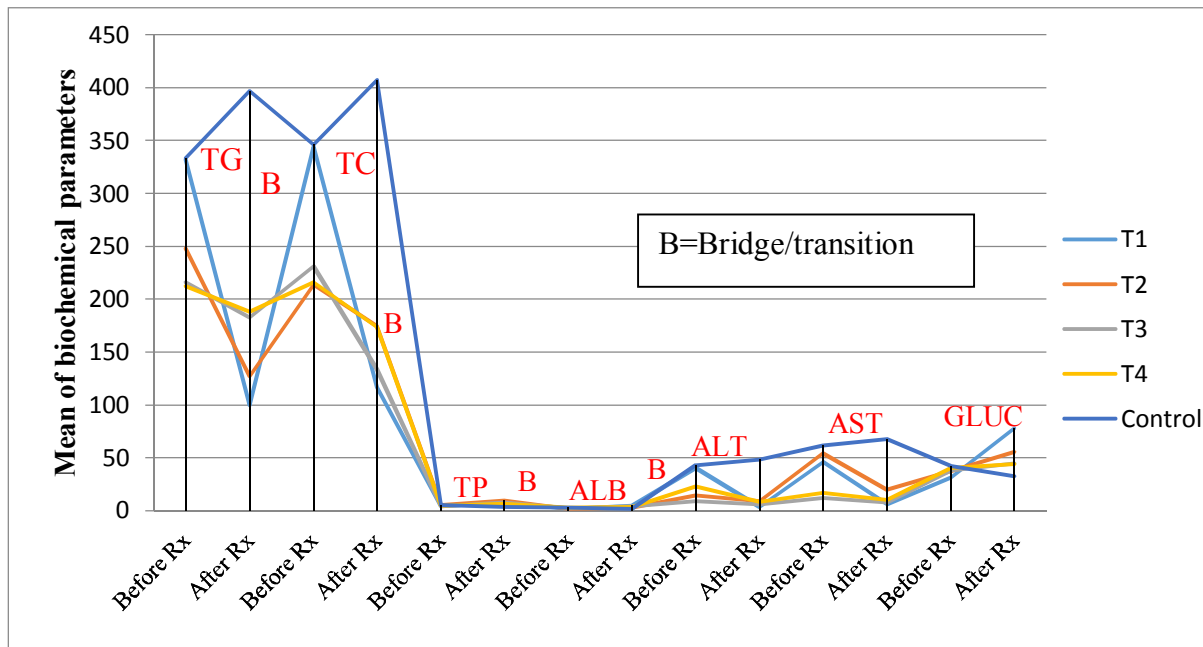


Figure 3: The Mean biochemical parameter values measured during the study period in four treatment groups and control group before and after treatment.

**Comparison Among Treatment Groups During Study Period**

The difference of the effect of treatments measured in all four treatment groups fluctuated within the range level of 0 and 1 throughout the study and no significant relation was detected among treatment groups based on the drug effect of treatment during the study period. Even though, temperature, heart rate, cholesterol, albumin, ALT and AST showed no significant ( $P>0.05$ ) variation were observed and respiratory rate, triglycerides, PCV, Hgb, TRBC, WBC and glucose showed significant ( $P<0.05$ ) variation was observed as shown table 4.

**Discussion**

Due to high mortality associated with hyperlipidemia, it is off considerable importance to veterinarians dealing with susceptible equine populations (Jeffcott and Field, 1985a; Watson and Love, 1994). Hyperlipidemia in the donkeys induces mortality from 86% to 95%, which is higher than that in the pony (Bulldan *et al.*, 2013).

Clinical signs monitored in this study are in accordance with that reported by Watson and Love (1994). In the present study, there was significant ( $P<0.05$ ) decrease in respiratory and heart rate after treatment during study period. The respiratory rate after treatment was not below the reference values ( $16.33\pm1.523$ ); this result is in agreement with ( $26.90\pm$

9.40) for donkeys reported by French, and Patrick, (1995), and Etana *et al.*, (2011).

Table 4: Treatments difference in four treatment groups using one way ANOVA.

<b>Physiological parameters</b>	<b>Groups</b>	<b>Mean ± SD</b>	<b>95% CI for mean</b>	<b>P-value</b>
<b>Temperature (°c)</b>	Group 1	38.03±0.208	37.51-38.55	0.6712
	Group 2	38.07±0.152	37.68-38.44	
	Group 3	38.33±0.472	37.159-39.509	
	Group 4	38.3±0.50	37.057-39.54	
<b>Heart rate/min</b>	Group 1	37.33±2.08	32.162-42.504	0.3693
	Group 2	33.67±4.725	21.927-45.40	
	Group 3	38.67±2.08	33.495-43.837	
	Group 4	35.33±4.163	24.991-45.675	
<b>Respiratory rate/min</b>	Group 1	16.33±1.527	12.538-20.127	0.0013
	Group 2	17.67±0.577	16.23-19.10	
	Group 3	17.67±0.577	16.232-19.108	
	Group 4	21.67±1.154	18.798-24.535	
<b>Hematological parameters</b>	<b>Groups</b>	<b>Mean ± SD</b>	<b>95% CI for mean</b>	<b>P-value</b>
<b>Packed cell volume (%)</b>	Group 1	19.35±0.68	17.64-21.05	0.0132
	Group 2	18.53±0.65	16.90-20.15	
	Group 3	19.46±0.85	17.35-21.57	
	Group 4	17.33±0.25	16.70-17.95	
<b>Hemoglobin estimation (Hgb/dl)</b>	Group 1	14.583±1.0408	11.997-17.168	0.0040
	Group 2	10.67±0.472	9.4927-11.840	
	Group 3	12.67±2.150	7.325±18.008	
	Group 4	9.3±0.5291	7.985-10.614	
<b>Total red blood cell (TRBC mm<sup>3</sup>)</b>	Group 1	14.1±2.1517	8.7547-19.445	0.0004
	Group 2	8.633±0.6429	7.036-10.23	
	Group 3	7.5±0.3605	6.604-8.395	
	Group 4	7.8±0.6557	6.171-9.428	
<b>WBC (mm<sup>3</sup>)</b>	Group 1	21.167±1.361	17.784-24.548	0.0013
	Group 2	25.2±0.458	24.061-26.338	
	Group 3	22.467±0.650	20.850-24.082	
	Group 4	21.86±0.211	21.334-22.385	
<b>Biochemical parameters</b>	<b>Groups</b>	<b>Mean ± SD</b>	<b>95% CI for mean</b>	<b>P-value</b>
<b>Triglyceride (mg/dl)</b>	Group 1	100.033±15.305	62.013-138.053	0.0003
	Group 2	127.067±25.532	63.640-190.492	
	Group 3	182.7±10.751	155.992-209.407	
	Group 4	188.2±2.645	181.627-194.772	
<b>Total Cholesterol (mg/dl)</b>	Group 1	116.71±23.578	58.137-175.282	0.2389
	Group 2	173.9±13.910	139.343-208.456	
	Group 3	133.433±66.275	31.205±298.072	
	Group 4	173.3±25.380	110.251-236.348	
<b>Total protein (g/dl)</b>	Group 1	7.7± 1.212	4.688-10.711	0.0521
	Group 2	9.5±0.793	7.528-11.471	
	Group 3	7.5±1.3	4.270-10.729	
	Group 4	6.62±0.771	4.703-8.536	
<b>Albumin (g/dl)</b>	Group 1	4.5±1	2.015-6.984	0.3216
	Group 2	3.1067±0.878	0.924-5.288	
	Group 3	3.9±0.964	1.504-6.295	
	Group 4	3.567±0.568	2.154-4.979	
<b>ALT/SGPT (IU)</b>	Group 1	3.7±2.007	1.286-8.686	
	Group 2	9.267±1.662	5.137-13.396	

	Group 3	6.2±5.963	8.613-21.013	0.2674
	Group 4	8.6±2.475	2.449-14.750	
<b>AST/SGOT (IU)</b>	Group 1	6 ±2.605	0.473-12.473	
	Group 2	19.967±12.963	12.237-52.170	
	Group 3	7.733±3.524	1.022-16.489	0.1362
	Group 4	10.267±1.193	7.303-13.230	
<b>Glucose (mg/dl)</b>	Group 1	78±8.928	55.820-100.179	
	Group 2	55.867±4.796	43.952-67.781	
	Group 3	44.67±1.709	40.419-48.913	0.0002
	Group 4	44.2±2.605	37.726-50.673	

There was fluctuation (within the normal range) in the values of rectal temperature observed in the study period, which is recorded before and after treatment as shown in table (2). In the present study the values were also within the recommended reference range recommended by other researchers (French, and Patrick, 1995, and Etana *et al.*, 2011).

There was significant ( $P<0.05$ ) decrease in PCV in all treatment groups after treatment was given and there was significant increase in hemoglobin concentration in the first and second treatment and accordingly in the rest treatment groups (table 3). This result is in agreement with that of Tarrant *et al.* (1998), who reported significant increase in the first day of a 10-year old, multiparous, female Jerusalem donkey that was presented with a 2-day history of mild depression, in appetite and lethargy. There was increase in PCV (46%) in the first day of hospitalization and then the level declined to (32%) following 12 days of hospitalization. Physiologically, this result could be justified as the animals decrease the intake of water during fasting which may lead to hemconcentration, and following re-feeding the animals tend to drink water as usual, resulting in hemdilution.

There was significant ( $P<0.05$ ) increase from decreased mean normal value of protein concentration in the treatment group after treatment give as shown (table 4). These results resemble with the findings of Bulldan *et al.*, (2013).

In the first treatment group (table 4), it could be observed that there was significant ( $P<0.05$ ) decrease in total triglycerides and total cholesterol during the study period after treatment (dextrose) applied in the diseased animals which were having increased level of triglyceride and total cholesterol, however, this result is in contrary with the report of Bulldan *et al.*, (2013), who reported that there was significant increase in triglyceride and total cholesterol when animals feeding carbohydrate feeds continuously in healthy natural condition. But it could be because the cause of hyperlipidemia can be either exogenous or endogenous. In the present study there was endogenous hyperlipidemia which supported by Bulldan *et al.*, (2013). He also reported that there was

significant increase in total triglycerides and total cholesterol concentration when animals withheld the feed.

Individual animals showed different TG level both between and within treatment groups during the study period this result is in agreement with that of Bulldan *et al.*, (2013), who reported, the level of TG vary between groups of animals which were fasting for few days. Furthermore, the difference in the individual animals in respect of lipid profiles during the present study was also in accordance with the findings of Bulldan *et al.*, (2013).

In the present study total cholesterol (8.91 mmol/l) and triglycerides (8.6 mmol/l) were high beyond the normal mean value before treatment but, there was decrease in cholesterol (3.02 mmol/l) and triglycerides (2.3 mmol/l) after treatment and this result is in agreement with Tarrant and his colleagues, (1998). He observed higher level of cholesterol before treatment (7.2 mmol/l) and reduced to 2.1 mmol/l following hospitalization and treatment for two weeks (reference values  $2.8\pm 0.8$ ). In this study the level of cholesterol was also high before treatment and reduced after treatment.

There was a highly significant ( $P<0.05$ ) increased of glucose concentration particularly in first and second treatment group, in comparison to the level of glucose increment in the third and fourth treatment groups. This result is an agreement with those of Moore and Woollard, (2005), reported that, administration of low concentration of dextrose 5% had a better effect than dextrose 50% for the treatment of hypoglycemic patients. In addition to increase in blood glucose level after treatment, dextrose 50% had many negative effects like; extravasations injury, cerebral edema, endothelia injury and neurotoxic effect, which were reported by Ziad and Daniel, (2009).

The level of ALT and AST were moderately decreased after therapeutic application with dextrose. This result is exactly in accordance with the findings of Bulldan *et al.*, (2013), and Dunkel and Mckenzie, 2003, who reported that, when animals are off feed or withholding their feed, the level of glucose is decreased, in contrary the level of triglycerides and total cholesterol which were increased



In donkeys, with naturally occurring hyperlipidemia, a positive correlation between plasma insulin and serum triglycerides concentration has been reported by Forhead *et al.*, (1994). Activities of lipoprotein lipase and hepatic lipase are higher in hypertriglyceridemia, feed-deprived donkeys than in fed donkeys (Frank *et al.*, 2006). This suggests that overproduction of triglycerides, possibly complicated by defective catabolism and is the predominant cause of hypertriglyceridemia (Watson *et al.*, 1992b).

### Conclusion And Recommendations

It is to be concluded that treating of hyperlipidemic donkeys for three days (with exclusion of other risk factors), especially with dextrose 5% with prednisolone 5mg, resulted in significant reduction of inappropriate elevated level of blood triglycerides, total cholesterol, packed cell volume and moderately increased the total red blood cells, blood total protein, albumin hemoglobin concentration and blood glucose level from hyperlipidemic donkeys. Next to dextrose 5% combination with prednisolone, dextrose 5% alone was good treatment during study period as second choice of treatment, when it is compared with the rest two treatments: dextrose 10% and dextrose 20% separately. Individual variation in the level of total cholesterol and triglycerides was observed within donkeys in relation to type and concentration of treatments. Therefore; this result gives a clue that out of the four treatment groups the combination of dextrose 5% plus prednisolone 5mg gives a better result for hyperlipidemic donkeys which were off feed during the study period. Therefore based on the above conclusion the following recommendations were forwarded:

Dextrose 5% plus prednisolone 5mg should be recommended for treatment of hyperlipidemic condition in donkeys, the appropriate dextrose concentration (5%) should be selected for the control and ameliorative measures of hyperlipidemia in donkeys, a field trial on different dextrose treatment groups that resulted in best effective response in diseased animals during the study period should be promoted and further work is required to test the contribution of other risk factors via: parasitism, pregnancy and lactation.

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