Open Veterinary Journal, (2023), Vol. 13(4): 481–484
ISSN: 2226-4485 (Print)
ISSN: 2218-6050 (Online)
Original Research
DOI: *10.5455/OVJ.2023.v13.i4.10*

Submitted: 18/12/2022 Accepted: 25/03/2023 Published: 21/04/2023

Internal parasites (nematode) infestation in pure Arabian horses: Field study

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Abstract

Background: Hematological and biochemical values are widely used in veterinary clinics for disease prognosis, nutritional and therapeutic monitoring, as well as in understanding the disease process in farm animals, including equines.

Aim: This study aims to assess the alterations in hematological and biochemical parameters in pure Arabian horses infested with internal parasites.

Methods: Samples of feces and blood were collected from 20 adult mares. Fecal samples were proceeded by flotation test. The blood samples were analyzed for hematological and biochemical parameters to determine their means ± standard error (M ± SE). We compared the M ± SE with the reference values cited.

Results: Infestation percentage was as (%) *Parascaris equorum* 3 (15%) and 17 (85%) mixed infestation, *Strongylus* species with *P. equorum*. The hematology of our Arabian horses shows a little variation of values compared to normal reference values, in hemoglobin level (g/dl), packed cell volume (%), red blood cell count (10^6/µl), and white blood cells count (10^3/µl), mean corpuscular volume (fl), mean corpuscular hemoglobin (pg) and mean corpuscular hemoglobin concentration (g/dl). In addition, their serum biochemistry showed blood glucose (mg/dl), urea (mg/dl), creatinine (mg/dl), albumin (g/dl), sodium, potassium, and chloride (mEq/l) within normal reference values.

Conclusion: Our study did not show variation in hematology or chemical values compared to the normal values. We attributed this a result of the quantity and quality of nutrition given to the horses, which compensate for the damage caused by these parasites, so this study may provide useful diagnostic indices for Arabian horses.

Keywords: Hematological, Biochemical, Parameters, Infestation, *Parascaris equorum*.

Introduction

Equines are prone to infestation with many types of parasites, which influence their health. Parasitic diseases stand out as a major challenge to the health and welfare of horses, especially in developing countries (Pritchard *et al.*, 2005).

Many researchers have been interested in studying gastrointestinal nematodes, especially blood-consuming species, because of their severe threat on animal health.

Endoparasitic infestation is most often subclinical and frequently was unnoticed by veterinarians, breeders, and horse owners. The main clinical symptoms in parasitic-infested horses included decreased appetite, loss of body weight, diarrhea, weakness, dullness, rough hair coat, colic, pruritus, pot-belly, malperfomance activity, and growth retardation (Shapiro, 2010; Hendrix and Robinson, 2012).

In horses, there are common different species of nematodes infested them, such as *Strongylus* spp., *Strongyloides* spp., *Cyathostoma* spp., and *Parascaris* spp. (Deplazes *et al*., 2016).

It is necessary to work hard to control these parasites as one of the problems facing the pure bred Arabian horses in the countries of the underdeveloped world and the developing countries in particular, by following many methods to protect livestock from parasites, including preventive and curative ones (Duncan, 1985).

The aim of this study is to assess the alterations in hematological and biochemical parameters in Arabian horses infested with internal parasites to detect any correlation between the infestation of the horses with internal parasites and alteration of the horse's blood picture.

Materials and Methods

Study location and animals

This study was conducted on 20 Arabian mares aged between 3 and 18 years old. All mares were belonging to Elkheir stud farm (Surman) for Arabian horses. Permission was obtained from the owner during the selection of the animals. The horses were kept under natural photoperiod and ambient temperature in individual stalls with free access to water and were fed

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twice daily with hay and barely grains at 2.5% of body weight per day (Freeman, 2017). They were grazed in the same pasture during the day and returned boxes at night. Mares were not dewormed for a long time with anthelmintics.

Sample collection and examination

Fecal samples

Fresh stool samples were collected from each animal individually in the morning in sterile containers immediately after rectum collection. Samples were cooled down to the temperature of 4°C during transportation for examination.

Each sample was microscopically examined using a floatation method.

For purpose of the flotation method 5 g of fecal sample was transferred to a glass beaker and 30 ml flotation solution (saturated NaCl solution) was added.

The mixture was stirred with a glass stick until it became homogenous, then it was filtered through a sieve and poured into a test tube, more flotation solution was added until the formation of the meniscus. A clean glass slide was applied on the meniscus and kept for 10–15 minutes, then examined under a microscope (Hamilton) with a magnification capacity 40× (Shapiro, 2010; Deplazes *et al*., 2016; Tagesu, 2018).

Blood samples

Blood samples were collected from the jugular vein of non-fasted animals in the morning time. One sample was collected into a tube with an anticoagulant (ethylene diamine tetra acetic acid tripotassium) for hematological investigation and the other sample was collected into a plain tube without an anticoagulant agent for biochemical analysis. Samples were transported by ice pack at −20°C for hemo-biochemical analysis.

Hematological parameters such as hemoglobin (Hb), packed cell volume (PCV), red blood cells (RBCs), white blood cells (WBCs), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were estimated using an automated hematology analyzer (Mindray BC-3000 Plus Auto Hematology Analyzer, China).

Plasma was obtained by centrifugation (4,000 rpm, 10 minutes) and stored at 20°C until analysis was performed. All plasma samples were analyzed for biochemical parameters such as blood glucose, urea, creatinine, albumin, sodium, potassium, and chloride using an automated analyzer (Easylyte Plus. Mideca, USA).

Data were analyzed using Statistical Package for the Social Sciences for Windows version 26 (2019). All parameters were reported as mean ± standard error (M ± SE).

Ethical approval

All animals were handled with care and patience, with no harm or violence. All samples were taken with professional methods, correct, and easily cool. All methods were conducted as they were approved in international measurements.

Results

In the present study, 20 fecal samples from adult Arabian horses were screened for gastrointestinal nematode infestation. The number of parasites was not mentioned, but it was confirmed without counting on the microscopic field. All samples were naturally infected, and the types of infestation were single or mixed nematodes. Only three mares showed (15%) *Parascaris equorum* infestation. While 17 (85%) showed mixed infestation with *P. equorum* and *Strongylus* species.

The hematological and biochemical parameters are presented as M ± SE for infected mares and normal reference values (Berjan, 2017) in Tables 1 and 2.

In infected mares, the mean Hb (11.49 ± 0.29), PCV (32.01 ± 0.95), and RBCs (6.66 ± 0.17) were slightly low or equal to the lower limit of the normal blood values whereas, the mean MCV (47.4 ± 0.82), MCH (17.2 ± 0.24), MCHC (36.7 ± 1.11) and WBCs (7.21 ± 0.42) values were within the normal range.

In the present study, the mean values of blood glucose were (68 ± 5.4), urea (33.4 ± 1.7), creatinine (1.4 ± 0.11), albumin (3.9 ± 0.07), sodium (134.9 ± 0.69),

Table 1. The average values of hematological parameters in parasitic infected horses and normal reference values for adult horses.

Parameters	Infected horse Mean ± SEM	Normal reference values
Hb (g/dl)	11.49 ± 0.29	10.1–16.1
PCV (%)	32.01 ± 0.95	32–43
RBCs ($\times 10^6$/µl)	6.66 ± 0.17	6.0–10.4
WBCs ($\times 10^3$/µl)	7.21 ± 0.42	5.6–12.1
MCV (fl)	47.4 ± 0.82	37–49
MCH (pg)	17.2 ± 0.24	13.7–18.2
MCHC (g/dl)	36.7 ± 1.11	35.3–39.3

Table 2. The average values of biochemical parameters in nematode infected horses and normal reference values.

Parameters	Nematode infected horse	Normal reference values
Blood glucose (mg/dl)	68 ± 5.4	62–134
Urea (mg/dl)	33.4 ± 1.7	24–48
Creatinine (mg/dl)	1.4 ± 0.11	1.2–1.9
Albumin (g/dl)	3.9 ± 0.07	2.6–4.1
Sodium (mEq/l)	134.9 ± 0.69	128–142
Potassium (mEq/l)	4 ± 0.12	2.9–4.6
Chloride (mEq/l)	101 ± 0.72	98–109

potassium (4 ± 0.12) and chloride (101 ± 0.72) were within normal reference values.

Discussion

In gastrointestinal nematode parasites infected mares, a single infestation was *P. equorum* whereas, the mixed infestation was *Strongylus* species with *P. equorum*. This observation was in correspondence with the previous study reported by Esmat *et al.* (1997); Nasr *et al.* (2013); Oli and Subedi (2018); and Katre *et al.* (2020).

The mean of Hb, PCV, and RBCs was slightly low or equal to the lower limit of the normal blood values. This could be attributed to the nature of helminth, particularly *Strongylus*, which are voracious bloodsuckers causing a direct loss of whole blood, leading to anemia (Shapiro, 2010; Deplazes *et al.*, 2016), furthermore, the decreased levels of Hb, PCV, and RBCs may also be because of reduced hemopoiesis because of poor metabolism and poor nutrition status. Our findings are in accordance with observations reported by Esmate *et al.* (1997); Parsani *et al.* (2011); and Katre *et al.* (2020). Other studies reported normal Hb, PCV, and RBCs (Noha *et al.*, 2015).

In the present study, the mean WBCs were within the normal range, similar to the observation reported by Esmate *et al.* (1997); Nasr *et al.* (2013); and Katre *et al.* (2020). However, some researchers reported an increase in WBCs in helminth-infected horses (Parsani *et al.*, 2011). An increase in WBCs of infected horses may be resulted because of irritation caused by the migration of the larva through the intestinal mucosa, causing damage and inflammation along the way (Shapiro, 2010; Hendrix and Robinson, 2012; Deplazes *et al.*, 2016).

In this study, the average of glucose level was in accordance with the reference range. This result was in correspondence with the previous study by Guzel *et al.* (2014). Some researchers reported low blood glucose levels in helminth-infected horses (Esmat *et al.*, 1997; Parsani *et al.*, 2011; Katre *et al.*, 2020). The low level of blood glucose might be due to the fact that adult worm uses glucose for their own metabolism. The parasites cause catarrhal enteritis because of penetration of the intestinal mucosa resulting in poor absorption of glucose through the intestine (Hendrix and Robinson, 2012; Deplazes *et al.*, 2016).

Protein concentration in serum is a common measurement in clinical laboratory diagnosis. Changes in the levels of plasma proteins may result from an alteration in synthesis, catabolism, or from protein losses. In this study, serum albumin level was within normal values. It was in agreement with the studies of Parsani *et al.* (2011) and Noha *et al.* (2015). Some researchers reported slightly low albumin level in helminth-infected horses (Esmat *et al.*, 1997; Nasr *et al.*, 2013; Guzel *et al.*, 2014; Katre *et al.*, 2020).

High levels of urea and creatinine are important markers in the presence of abnormal renal function (Barrelet and Ricketts, 2002; Munroe and Weese, 2011). Serum urea and creatinine recorded for the horses in the present study were within normal reference ranges. This result is in agreement with Guzel *et al.* (2014). Whereas, Nasr *et al.* (2013) recorded lower serum urea levels. The lower urea levels may be because his study was carried out on draft horses during the dry season of higher environmental temperatures and greater water loss through sweating (Ihedioha and Agina, 2013). Some studies reported high creatinine levels in infected horses (Parsani *et al.*, 2012; Nasr *et al.*, 2013). These high levels of creatinine may show damage to the kidney and liver by larvae.

In the current study, we observed that mean values of Na, K, and Cl were within the normal reference range. A similar finding was reported by Guzel *et al.* (2014), meanwhile Esmat *et al.* (1997) reported a significant decrease in Na, K, and Cl levels. The lower electrolytes levels could be because of the parasites cause catarrhal enteritis resulting in poor absorption and loss of minerals and liquid through the intestines (Hendrix and Robinson, 2012; Deplazes *et al.*, 2016).

Generally, differences detected in the values of observed hematological and biochemical parameters could be due to breed, differences in geographical, physiological, and environmental conditions, nutritional factors, and management.

From this study, we noticed that our herd was totally infested with different types of internal parasite because of the absence of effective deworming program, and because the horses graze in the same pasture periodically which let the horses consummate shed ova every time lead to newer infection.

Even though our horses did not show variation in hematology or chemical values compared to the normal values. We attributed because of the quantity and quality of nutrition given to the horses, which compensate the damage caused by these parasites.

However, an effective deworming program should be assigned for these horses and a new study should be conducted on these horses to detect any alterations that can be noticed in their body condition, performance, and fertility, followed by using different dewormers include natural herpes and plant parts and pharmaceuticals, to compare the results in controlling the parasite.

Conflict of interest

All authors declare that there is no conflict of interest.

Acknowledgment

Our thanks go to the staff members of a college of veterinary medicine and agriculture at Zawia University (Ajilat) and to people of college veterinary medicine at Tripoli University for their helping. We thank the people of Elkheir stud (Surman) for providing help in sampling the horses.

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