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Incidence of gastrointestinal parasites by stool examination methods in horses in Van

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ABSTRACT

Objective: This study was carried out to determine the distribution of digestive system parasites in horses in İpekyolu, Tusba, Özalp, Saray, and Gürpınar districts in Van Province, Turkey between June 2019 and May 2020.

Materials and Methods: Materials for this study consist of a total of 95 horse stool samples, 58 male and 37 female, from different races, ranging in age from 1 to 12 years.

Results: Various parasitic infections were detected in 65 (68.42%) of the 95 horses examined by stool examination. While 55 of the 65 infected horse stool samples were infected with a single species, the remaining 10 stool samples were infected with two species. In infected horses, the most common parasites were *Strongylidae* spp. (44.21%) followed by *Parascaris equorum* (11.57%), *Eimeria leuckarti* (6.31%), *Anoplocephala* spp. (5.26%), *Oxyuris equi* (4.21%), *D. dendriticum* (3.16%), and *Fasciola* spp. (4.21%). When the infected horses were evaluated according to age groups, parasitic infections were detected in 34 (35.79%) horses aged 8 years and above, 29 (30.53%) between the ages of 5-7, and 12 (12.63%) between the ages of 1-4. As for gender groups, parasitic infections were found in 38 (65.51%) of the 58 male horses and 27 (72.92%) of the 37 female horses. When the parasite species were examined, it was determined that the highest infection rate was in the Strongylid type egg. There was a statistically significant relationship between parasite species and infection rate ($p<0.05$). A statistically significant relationship between parasite species and age was determined only in the Strongylid type egg parasite ($p<0.05$).

Conclusion: This study concluded that the horses in Van Province were infected with various parasite species. Helminth infections were found to be the most common type of parasites, and we think that more frequent examination and treatment should be conducted to fight parasites.

Keywords: Gastrointestinal parasite, Horse, Van, Turkey

INTRODUCTION

Horses are animals that people cannot live without not only for sporting activities but also for agriculture and transportation purposes in rural areas in our country. In the Van region, horses are used for sporting purposes as well as in agriculture and transportation. The fact that horses are not healthy in terms of bacteriological, virological, parasitological, and mycotic diseases leads to

serious performance degradation and even death. Parasitic diseases, which are among the important infectious diseases in horses, can significantly affect the performance of these animals. Therefore, effective parasitic treatment and control are important for both animal health and animal welfare. In the digestive system of horses, nematodes, cestodes, trematodes, and protozoa are found (Jacobs, 1989; Öge, 2002).

In studies based on stool examination and necropsy, the prevalence of equine helminths was determined at a rate of (27.6-100%) and (16.2-100%) in the world and in Turkey respectively and the most common helminths are strongyloid infections (62.7-100%), followed by *Parascaris equorum*, *Oxyuris equi*, *Dictyocaulus arnfieldi*, *Strongyloides westeri*, *Trichostrongylus axei*, *Draschia megastoma*, *Habronema spp.*, *Fasciola hepatica*, *Dicrocoelium dendriticum*, *Anoplocephala magna*, *Anoplocephala perfoliata* and *Paranoplocephala mamillana* (Dunsmore and Jue, 1985; Öge, 1991; Özer and Küçükerden, 1992; Tınar et al., 1994; Arslan and Umur, 1998; Pişkin et al., 1999; Gül et al., 2003; Bakırcı et al., 2004; Pereira and Vianna, 2006; Ulutaş and Efil, 2012; Kozan and Güzel, 2015). In addition, protozoal infections caused by *Eimeria leuckarti*, *E. solipedium* and *E. uniungulati* have also been reported in horses (Oğuz, 1971; Özer and Küçükerden, 1992; Tınar et al., 1994; Öge, 2002; Bakırcı et al., 2004). This study was carried out to determine the prevalence of digestive system parasites in horses in Van Province.

MATERIALS and METHODS

This study was carried out in İpekyolu, Tusba, Özalp, Saray, and Gürpınar districts in Van Province between June 2019 and May 2020. The materials for this study consist of a total of 95 horse stool samples, 58 male and 37 female, from different races, ranging in age from 1 to 12 years. Fecal samples were gathered from the horses which were not given any parasitic drugs before. Collected fresh stool samples were brought to the laboratory on the same day after being placed in separate stool containers. Stool samples were examined for nematodes, cestode eggs, and protozoan oocysts by Fülleborn's flotation method prepared with saturated salt water, by sedimentation method for trematode eggs and *E. leuckarti* oocysts, and by

Baermann-Wetzel methods for *D. arnfieldi* larvae (Stoye, 1984; Thienpont et al., 1986). This study was approved by Van Yuzuncu Yil University Animal Researches Local Ethic Committee with the number of 2022/04-01.

Evaluation of research data was done with SPSS (Ver. 13.0) package program. In the evaluation of the data, descriptive statistics are given as numbers and percentages. The relationship between categorical variables was evaluated with the chi-square test. Statistical significance was accepted as $p < 0.05$ (SPSS. IBM SPSS statistics version 13.0 for Windows. New York: IBM Corp.)

RESULTS

Various parasitic infections were detected in 65 (68.42%) out of the 95 horses. Infection with one species was found in 55 of the 65 infected stool samples, and with two species in 10 stool samples (Table 1, Table 2).

Table 1. The rate of infections (%) with a single species in horses according to their stool examination (n: number of infected animals).

Parasitic Species	n	Infection rate* (%)
<i>Strongylid</i> type egg	34	35.79
<i>Parascaris equorum</i>	6	6.31
<i>Eimeria leuckarti</i>	3	3.16
<i>Anoplocephala</i> spp.	4	4.21
<i>Oxyuris equi</i>	3	3.16
<i>Dicrocoelium dendriticum</i>	2	2.10
<i>Fasciola</i> spp.	3	2.16

*: There was a statistically significant relationship between parasite species and infection rate ($p < 0.05$). When the parasite species were examined, it was determined that the highest infection rate was in the *Strongylid* type egg.

Table 2. The rate of infections (%) with two species in horses according to their stool examination (n: number of infected animals).

Parasitic Species	n	Infection rate (%)	p*
<i>Strongylid</i> type egg + <i>Parascaris equorum</i>	3	3.16	
<i>Parascaris equorum</i> + <i>Eimeria leuckarti</i>	1	1.05	
<i>Eimeria leuckarti</i> . + <i>Strongylid</i> type egg	2	2.10	
<i>Anoplocephala</i> spp.+ <i>Strongylid</i> type egg	1	1.05	0.853
<i>Oxyuris equi</i> + <i>Parascaris equorum</i>	1	1.05	
<i>Dicrocoelium dendriticum</i> + <i>Strongylid</i> type egg	1	1.05	
<i>Fasciola</i> spp. + <i>Strongylid</i> type egg	1	1.05	

*: There was no statistically significant relationship between parasite species and infection rate ($p > 0.05$).

In infected horses, the most common parasites were Strongylid-type eggs (44.21%) followed by *Parascaris equorum* (11.57%), *Eimeria leuckarti* (6.31%), *Anoplocephala* spp. (5.26%), *Oxyuris equi* (4.21%), *D. dendriticum* (3.16%), and *Fasciola* spp. (4.21%) (Table 3).

Table 3. Parasites detected in horses according to stool examination results (n: number of infected animals).

Parasitic Species	n	Infection rate* (%)
<i>Strongylid</i> type egg	42	44.21
<i>Parascaris equorum</i>	11	11.57
<i>Eimeria leuckarti</i>	6	6.31
<i>Anoplocephala</i> spp.	5	5.26
<i>Oxyuris equi</i>	4	4.21
<i>Dicrocoelium dendriticum</i>	3	3.16
<i>Fasciola</i> spp.	4	4.21

*: There was a statistically significant relationship between parasite species and infection rate ($p < 0.05$). When the parasite species were examined, it was determined that the highest infection rate was in the *Strongylid* type egg.

Table 4. Distribution of parasites by age.

Parasitic Species	The age range of infected animals			p*
	1-4 ages	5-7 ages	8 ages and older	
	n (%)	n (%)	n (%)	
<i>Strongylid</i> type egg	6 (6.31)	16 (16.84)	20 (21.05)	0.013
<i>Parascaris equorum</i>	2 (2.10)	4 (4.21)	5 (5.26)	0.516
<i>Eimeria leuckarti</i>	3 (3.26)	1 (1.05)	2 (2.10)	0.600
<i>Anoplocephala</i> spp.	1 (1.05)	2 (2.10)	2 (2.10)	0.816
<i>Oxyuris equi</i>	-	3 (3.26)	1 (1.05)	0.312
<i>Dicrocoelium dendriticum</i>	-	2 (2.10)	1 (1.05)	0.561
<i>Fasciola</i> spp.	-	1 (1.05)	3 (3.26)	0.312
Total	12 (12.63)	29 (30.53)	34 (35.79)	

n: number of infected horses; *: A statistically significant relationship between parasite species and age was determined only in *Strongylid* type egg parasite ($p < 0.05$). Infection rate of *Strongylid* type egg parasite was determined as 21.05% in horses aged 8 years and older. There is a statistically significant relationship between other parasite species and age ($p < 0.05$).

Table 5. Parasite infection distribution by gender.

Gender	Male (%)	Female (%)	p*
Infected	38 (65.51)	27 (72.92)	0.446
Non-Infected	20 (34.48)	10 (27.02)	-
Total	58	37	-

*: There was no statistically significant relationship between gender and infection rate ($p > 0.05$).

When the infected horses are evaluated according to their age groups; parasitic infections were detected in the feces of 34 (35.79%) horses aged 8 and older, 29 (30.53%) in the 5-7 age group, and 12 (12.63%) horse feces in the 1-4 age group (Table 4). As a result of the examination, Strongylid-type eggs were found to be the most common parasites in all three age groups, followed by *P. equorum* eggs and *Eimeria leuckarti* oocysts. As for gender groups, parasitic infections were found in 38 (65.51%) of the 58 male horses and 27 (72.92%) of the 37 female horses (Table 5).

When the parasite species were examined, it was determined that the highest infection rate was in the Strongylid type egg. There was a statistically significant relationship between parasite species and infection rate ($p < 0.05$). A statistically significant relationship between parasite species and age was determined only in the Strongylid type egg parasite ($p < 0.05$).

DISCUSSION

A number of studies conducted in Turkey to determine helminth infections of equidae according to stool examination. It has been reported that the majority of helminth infections seen in equidae originate from pastures. In studies conducted in various provinces, it has been reported that parasitic infection rates of equids range from 16.2% to 100% (Aydenizöz, 2004; Karaca et al., 2005; Altaş et al., 2005; Uslu and Güçlü, 2007; Umur and Açııcı,

2009; Ulutaş and Efil, 2012; Kozan and Güzel, 2015). Studies conducted in Turkey and worldwide have reported *Strongylidae*, *Anoplocephalidae*, *P. equorum*, and *O. equi* species as the most frequently detected helminths in Equidae (Karaca et al., 2005; Pereira and Vianna, 2006; Uslu and Güçlü, 2007; Umur and Açıcı, 2009). In this study, 65 (68.42%) of the 95 horses examined were infected with various parasites with strongyloid (44.21%) being the most common form of In infection, followed by *P. equorum* (11.57%), *E. leuckarti* (6.31%), *Anoplocephala* spp. (%) 5.26), *O. equi* (4.21%), *Fasciola* spp. (4.21%), and *D. dendriticum* (3.16%).

In studies conducted in Turkey, *Strongylidae* are reported to be the most common helminths in equidae (Öge, 1991; Özer and Küçükerden, 1992; Tınar et al., 1994; Arslan and Umur, 1998; Pişkin et al., 1999; Gül et al., 2003; Bakırcı et al., 2004; Ulutaş and Efil, 2012; Kozan and Güzel, 2015). *Strongylidae* spp. has been reported in 88.86% of the horses in agricultural holdings, 100% of equids in the Kars region, 71.76% of Gemlik Military Stud farm Horses, 63.04% of purebred Arabian horses in the Şanlıurfa region, 100% of horses and donkeys in Konya, and 100% of horses in Afyon region (Arslan and Umur, 1998; Bakırcı et al., 2004; Altaş et al., 2005; Uslu and Güçlü, 2007; Kozan and Güzel, 2015). In Van Province, Karaca et al. (2005), and Erdoğan (2019) reported *Strongylidae* spp. in 96.4% and 60% of the horses respectively. In this study, Strongylid type eggs were detected in 44.21% of the horses and this rate was found to be significantly lower than the rate reported by other studies conducted in Turkey (60-100%) and Van (60-96.4%). We believe that the reason for this may be horse breeds, pasture or intensive nutritional status, etc.

The prevalence of *Parascaris equorum* has been reported to be between 0.5% and 42.9% in different studies conducted in Turkey according to stool examinations (Gülbağçe, 1990; Demir et al., 1995; Pişkin et al., 1999; Aydenizöz, 2003; Gül and ark., 2003; Bakırcı et al., 2004; Altaş et al., 2005; Karaca et al., 2005; Uslu and Güçlü, 2007; Umur and Açıcı, 2009; Toktamis and Yaman, 2012; Ulutaş and Efil, 2012; Kozan and Güzel, 2015). Karaca et al. (2005) reported the prevalence of *Parascaris equorum* to be 35.8% in their study in Van while *P. equorum* was not found in another study also conducted in Van (Erdoğan, 2019). In the current study, *P. equorum* was found in 11.57% of the horses in the Van region. We think that the reason for the different findings in these two studies is that the samples were collected from different regions of Van. However,

the rate determined in this study is compatible with other studies reported in Turkey (Gülbağçe, 1990; Demir et al., 1995; Bakırcı et al., 2004; Çırak et al., 2005; Uslu and Güçlü, 2007; Umur and Açıcı, 2009).

Studies have reported that the most common types of cestode infections in horses are *Anoplocephala perfoliata* and *A. manga*. The spread rate of these parasites has been recorded as 0.2-15.8% (Özer and Küçükerden, 1992; Tınar et al., 1994; Burgu et al., 1995; Arslan and Umur, 1998; Pişkin et al., 1999; Karaca et al., 2005; Erdoğan, 2019). While *Anoplocephalidae* spp. was reported as 2.9% in a study conducted in Van Province, it was reported as 8% in another study (Karaca et al., 2005; Erdoğan, 2019). In the present study, *Anoplocephala* spp. was detected at a rate of 2.9%, and the results are compatible with the above-mentioned studies conducted in Turkey according to stool examinations.

In autopsy studies reported in different parts of the world, *Oxyuris equi* has been recorded at a rate of 7-90% (Bucknell et al., 1995; Barbosa et al., 2001; Pereira and Vianna, 2006), and 4.1-17% in stool examinations (Sotiraki et al., 1997; Eslami et al., 2005). In Turkey, Burgu et al. (1995) found *Oxyuris equi* as 30% in their autopsy study, while it was reported to be between 0.6-7.6% in some studies based on stool examinations (Demir et al., 1995; Pişkin et al., 1999; Gül et al., 2003; Bakırcı et al., 2004; Altaş et al., 2005; Uslu and Güçlü, 2007; Umur and Açıcı, 2009). Erdoğan (2019) detected 4% of *Oxyuris* spp in his research in Van. In this study, *Oxyuris equi* was found to be 4.21% and this rate was found to be consistent with studies conducted in Turkey through stool examination.

In studies conducted in different regions of Turkey on the presence of *F. hepatica* in horses (Arslan and Umur, 1998; Gül et al., 2003) and *D. dendriticum* (Demir et al., 1995), *D. dendriticum* was found to be 0.9-1%, (Demir et al., 1995; Aydenizöz, 2004; Uslu and Güçlü, 2007; Umur and Açıcı, 2009), and *Fasciola* spp. as 0.9-5.8% (Demir et al., 1995; Arslan and Umur, 1998; Gül et al., 2003; Karaca et al., 2005; Uslu and Güçlü, 2007; Umur and Açıcı, 2009). However, Bakırcı et al. (2004), reported that they did not find these trematodes in their study on Gemlik military stud farm horses. In Van Province, Karaca et al. (2005) reported that they detected *Fasciola hepatica* at a rate of 5.8% in horses, and Erdoğan (2019), detected *Fasciola* spp. at 2% and *Dicrocoelium* spp. at 2% in horses. In this study, *D. dendriticum* was detected at a rate of 3.16%, and

Fasciola spp. at a rate of 4.21%, and these rates are consistent with reported studies in Turkey.

In this study, *Eimeria leuckarti* was found to be 6.31% in the stool examination of horses. *E. leuckarti* has been reported in Germany in 80% of foals (Beelitz et al., 1994), and in 7.6% of equidae in Iran (Karimi ghahfarrokhi et al., 2014). In Turkey, *Eimeria leuckarti* in horses was first reported by Oğuz (1971). It was reported that this parasite was encountered at rates between 0.4-5.88% (Tinar et al., 1994; Arslan and Umur, 1998; Bakırcı et al., 2004). *Eimeria leuckarti* was reported in 0.4% of horses in Bursa Province (Tinar et al., 1994), 3.8% of equidae in Kars Province (Arslan and Umur, 1998), 4.5% of horses in Konya Province (Uslu and Güçlü, 2007) and 1% of horses in Van Province (Erdoğan, 2019). A study conducted in Erzurum Province reported no *E. leuckarti* in the horses examined (Avcıoğlu et al., 2016).

CONCLUSION

This study found that the horses in Van Province were infected with various parasite species. Strongylid-type nematode eggs were found to be the most common type of parasite in the examined horse stools. The current study also concluded that helminth infections were more widespread, indicating the development of resistance against these parasites. Intense helminth infections in horses cause loss of productivity and poor performance. Therefore, it is necessary to inform the breeders about these parasites and to warn them to take the necessary precautions. Effective parasite control is recommended and antiparasitic drugs should be used in antiparasitic control programs carried out in horses with focus on fight against this group of helminths.

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Author's Contributions: VD and AK designed the study. VD and AK performed surgeries. VD performed statistical analysis. AK participated in drafting and revising the manuscript. VD: Vural Denizhan, AK: Ayşe Karakuş. All authors have read and agreed to the published version of the manuscript.

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