Research Article

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2023.54.008483

Prevalence and Associated Risk Factors of Gastrointestinal Parasites in Horse in and Around Hawa Gelan District, Kellem Wollega Zone, Ethiopia

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ARTICLE INFO

Received: November 23, 2023

Published: December 05, 2023

Citation: Oscar Martínez, Margarita Baldion, Hector A Gonzalez, Carlos E Saavedra, Daniela M Bertel, Paula Rodríguez, Alejandro Rueda Rodriguez and Juan P Vargas. Prevalence and Associated Risk Factors of Gastrointestinal Parasites in Horse in and Around Hawa Gelan District, Kellem Wollega Zone, Ethiopia. Biomed J Sci & Tech Res 54(1)-2023. BJSTR. MS.ID.008483.

ABSTRACT

A cross-sectional study was conducted from May 2021 up to Feb 2022 in and around Hawa Gelan District, Kellem Wollega zone, Oromia Regional State, Ethiopia to estimate the prevalence of horse's gastrointestinal tract (GIT) parasites and assess the associated risk factors. Fecal samples were collected from 384 randomly selected horses of varied sexes for the study and examined with coprologic examination. The overall prevalence of GIT parasites was 88.0% (338/384) with mixed infection of 27.6% (106/384) of the horses. Infection with one species of helminthes were more common 265 (60%) than infections with two 86 (22.4) and three 10 (2.6%) species of helminthes. The types of helminth parasites detected includes Parascarisequorum126 (32.8%), Strongyle116 (30.2%), Dictyocaulus arnfieldi18 (4.7%), *Oxyurisequi43* (11.2%), Triodontophorus158 (41.1%) and *Anoplocephala 6* (1.6%). Age related prevalence of *Parascaris equorum* were observed having 60.3% and 25.9% in young and old respectively and the prevalence status was found to be statistically significant (P<0.05). The prevalence of *P. equorum* was also higher in mares (50%) than their counterpart stallions (29.5 %) and the prevalence status was found to be statistically significant (P<0.05). Hence, this finding indicated that helminthes parasites are more prevalent in the study area. So that, proper screening and monitoring of the horses should be carried out regularly, regular and strategic deworming programmes should be carried out, and. further studies on should be done to know the seasonal prevalence of GIT parasites of horses.

Keywords: Hawa Gelan; Gastrointestinal Parasites; Coproscopic; Horses; Prevalence

Abbreviations: GIT: Gastrointestinal Tract; RSA: Republic of South Africa; MASL: Meters Above Sea Level; GI: Gastrointestinal; BCS: Body Condition Score

Introduction

In the developing world, there are an estimated 110 millions of equines (FAOSTAT, 2008). Ethiopia has about 7.9 million equines [1] and possesses approximately half of the Africa's equine population with 37% donkeys, 58% horses and 4.6% mules [2]. There is one equine for every four peoples in the agricultural sector and for every five persons of the total population [3]. Equines have a prominent position in the agricultural systems of many developing countries. In Ethiopia, the low level of development of the road transport network and the rough terrain of the country make the donkey and the horses the most valuable, appropriate and affordable pack animals under the small holder farming system [4]. They can be used for such applications as riding, driving, flock protection, companion, breeding, training calves [5] and provide urban dwellers with opportunity of income generation [6]. Ethiopia is one of the developing countries in Africa, which is predominantly an agricultural country with over 85% of its population engaged in agricultural activity [7]. The country has the gets equine population probably with the highest density per square kilometer in the world [8] and it has a total of 6.9% and 42.4% in

the world and Africa equine population respectively [6]. Ethiopia possess about 5.02 million donkeys, 2.75 million horses and 0.63 million mules [9]. Equine play an important role in the transportation of farm products, fodder, fuel, wood, agricultural inputs and construction and waste Materials .Equine power is both a rural and urban transport system which is cheap and viable and provides the best alternative in palace where the good network is insufficiently developed, other terrains gagged and mountains and cities where narrow streets prevent easy delivery of Merchandise [10].

In comparison with other equines, the horse plays a dominant role due to its physical and physiological characteristics and easily demonstrates drought ability and often shows great willingness to undertake such works [2]. Hence, cart horses are a business of way of life and generate a large amount of revenue in the area as a source of sustainable daily income for many people in the town [11]. Horses involved in pulling carts often work continuously for 6 to 7 hours/day [12]. Although equines play a significant role in the economy of the country, the development programs of the government and those of aids agencies pay more attention to the maintenance of cattle, because it provides meat, milk, and egg and wool production while equines have been completely neglected or omitted from the pastoral livestock programmes. This is because of the contribution of equines power in the agricultural system and their role in the productions not yet well recognized and magnified [13]. Despite the large numbers of horses and the valuable services they provide in Ethiopia, the attention given to their health and welfare is minimal as a result they have still health problems due to presence of malnutrition, management constraints and diseases like parasites. Parasitism represents a major obstacle to development of livestock sectors and hampers the poverty alleviation programs in livestock farming system in Ethiopia [14-16] and causing serious health hazards contributing to poor body condition, reduced power output short life span. Horses, among most domestic animals are reported to be more susceptible to a large number of parasites and may harbor different species at any time [17] which act up and damage the intestine depending on the age and natural defense of the individual equine [18]. This is because, the gastrointestinal tract provides favorable environment for the survival and proliferation of many of these parasites [19]. The most important factor favoring the existence of internal parasite is age as it is important diagnostic consideration because susceptibility to parasites varies with age of horse and degree of exposure to the worms. Foals are the most susceptible to the thread worms (*S.westeri*) in the first few months of life following infection via mare's milk. Ascaris infection *(P.equorum)* often a cause of intestinal blockage in foals leading to in appetence and more consequentially impaction and colic rarely in mature horses [20]. Generally, young horses carry larger parasite burdens than older horses and they are also more sensitive to parasites [21].

The most common internal parasite of equines includes strongyle, *parascaris equorum, dictyocaulus arnfieldi, triodontophorus* and *pinworms (Oxyurisequi)*. Additionallyless important infection tapeworms, anoplocephala and the intestinal thread worms distributed to appropriate site of the country [20,22]. Heavy infection of *parascaris equorum* causes impaction and perforating leading to peritonitis [23]. An acquired resistance to *Parascaris aquarium* usually develops before second years of life and therefore cases is highly reported from younger animals [24]. Most of pathogenic effect of *oxyuris equi* in the intestine is due to inflammatory responses. The presence of parasite cause intense pruritis around the anus cause the animal to rub, resulting in broken hair and inflammatory of the skin over the rumba and tail of head [25]. Among internal parasites, *Strongylosis* is also the most common diseases of horses throughout the world and cause death when control measures are neglected [23]. The disease process caused by strongyles can be produced by migrating larvae and by adult worms. Larval of *Strongylus* vulgaris are the most pathogenic, causing arthritis, thrombosis and thickening of artery wall [26]. Different studies have described that the prevalence and type of internal parasites affecting eqiuds, in general, are ubiquitous with equines being continually exposed throughout their lives [23].

A large study looking at the association between poverty and animal disease [27] identified gastrointestinal (GI) parasitism as one of the most important problems for equids in developing countries. Studies conducted in Ethiopia and Mexico estimate the prevalence of endoparasite infections at over 90% in horses [28] and over 80% in donkeys [29]. Gastrointestinal parasite burdens also seem to be substantial in donkeys in The Gambia [30] and Republic of South Africa (RSA) [31]. Even though few studies were reported about the internal parasites of horses in the other parts of Ethiopia, there was no comprehensive study conducted on prevalence of internal parasites of horses, in and around Hawa Gelan district. Therefore, this study is designed to investigate the prevalence of internal parasites of horses, estimate the prevalence of different genera of parasites and to assess host-related risk factors in the study area.

Materials and Methods

Study area Description

The study was conducted in and around Hawa Gelan district from May, 2021 to Feb, 2022. The Hawa gelan district is located in Ethiopia, Kellem Wollega zone of Oromia regional state, situated at 600bkilometers west of Addis Ababa. These areas are at an altitude of 1200-2000 meters above sea level (masl). The area receives a mean annual rainfallranges from (1150–1300mm) and annual temperature ranging from 26 ^{0}c to 34 ^{0}c. Agriculture is the main stay of the livelihood of the society with mixed farming system and liestock play an integral role for agriculture [32].

Study Animals

A study was conducted on 384 randomly selected horses. Information about sex, age, and body condition and management system of the study animals was gathered from the owners. The ages of animals were determined using owners' information and dentition [33]. Ac-

cordingly, animals was categorized as young (<2 years), adults (3-10 years) and old beyond 10 years. Body condition score (BCS) was subjectively estimated based on the guides published by [34].

Study Design

A Cross-sectional study was conducted on 384 randomly selected horses of local breed found in and around Hawa Gelan district to determine the prevalence of helminthes parasites in horse and also to compare the occurrence of the parasites depending on the types of sex, age groups and the body condition. Feces samples were carried out correspondingly with the required data (sex, age, body condition, etc.) were recorded. Fecal samples collection and examination was carried out from horses which were dewormed with anthelmintic three months ago.

Sample Size Determination

The number of animals required for the study was determined using the formula given by [35] by using simple random sampling methods and 95% confidence interval with required 5% precision.

$$\frac{n = 1.962 P_{exp}(1 - P_{exp})}{d^2}$$

Where; n= required sample size

P_{exp}=expected prevalence

d= required precision

The expected prevalence of helminthes parasites was 50% with the required precision (d) of 5% (0.05). By substituting the value in the above formula, we get the sample size:

$$n = \frac{1.962 \times 0.5(1 - 0.5)}{(0.05)^2} = 384$$

Study Methodology

Sampling Technique

Fecal samples were taken directly from the rectum or from the ground with strict sanitation when the animals were seen defecating and placed in universal bottles. Each sample was labeled with animal identification (sex, age, BCS and owner's name) and then brought to Hawa Gelan veterinary clinic laboratory. Samples were kept in refrigerator at 4°C to be examined for coproscopic examination. Fecal samples were preserved with10% formaldehyde [36].

Coprological Examination

Fecal examination was carried out by direct smear, sedimentation and floatation technique. The floatation fluid used in this study was supersaturated solution of sodium chloride (Nacl) salt prepared in the laboratory. The procedure given by Urquhart, et al. [25] was followed for the above parasitological methods. The Eggs were identified using ova identification keys [26].

Data Analysis

Data collected from the study animals were coded and entered in a Microsoft Excel sheet. All statistical analyses were performed using SPSS version 22 for windows. The association between prevalence of each studied parasite and the study variables (age, sex, and BCS) was analyzed by Chi-square test. In all the analyses, confidence level was held at 95% and P-values <0. 05 were considered as statistically significant.

Results

From the examined animals 338 (88.02%) were positive for different helminthic parasites. These includes *Parascarisequorum 126* (32.8%), *Strongyle 116* (30.2%), *Dictyocaulus arnifieldi* 18(4.7%), *Oxyurisequi 43* (11.2%), *Triodontophorus 158* (41.1%) and *Anoplocephala 6* (1.6%) (Table 1). Infection with one species of helminthes were more common 265 (60%) than infections with two 86 (22.4) and three 10 (2.6%) species of helminthes. Mixed infections were detected in 106 (27.6%) of the horses. The coproscopy results revealed that, the highest prevalent helminthes in good body condition animals was *Triodontophorus* (39.3%) and the least was Anoplocephala (2.2%). Similarly, in Poor Body Condition Animals the highest Prevalent Parasite was *Triodontophorus* (43.8%) and least was *Anoplocephala* (0.6%) (Table 2). There was no statistical significant difference (P>0.05) in prevalence of strongyle, O. equi, *P.equorum*, *Anoplocephala*, *D. arnfieldi* and *Triodontophorus* between the body conditions as examined by coproscopy.In adults *Triodontophorus* (39.6%) and *Anoplocephala* (1.8%) were the highest and lowest respectively. In old age the highest was Triodontophorus (44.9%) and the lowest was *Anoplocephala* (2.0%). There was a statistically significant difference in the prevalence of *P.equorum* with ages of horses (P<0.05). However, the effect of age on the prevalence of Strongyle, *D. arnifieldi, O.equi, Triodontophorus* and *Anoplocephala* was not statistically significant (P>0.05) (Table 3). The prevalence of helminthes in both sex groups were determined by coproscopy technique employed. In females *Triodonthophorus* (41.9%) and *Anoplocephala* (0.0%) were the highest and lowest respectively, in males *Triodontophorus* (41.0%) and *Anoplocephala* (1.9%) were the highest and lowest respectively (Table 4). There was statistically significant difference in the prevalence of *P.equorum* with sex of horses (P<0.05) However, the effect of sex on the prevalence of other identified parasites was statistically not significant (P>0.05).

Table 1: Prevalence of different parasites recovered from fecal examination.

Parasites Identified	Frequency	Percent (%)
Parascarisequorum	126	32.8%
Strongyle	116	30.2%
Dictyocaulus arnifieldi	18	4.7%
Oxyurisequi	43	11.2%
Triodontophorus	158	41.1%
Anoplocephala	6	1.6%
Mixed infection	106	27.6%
Overall	338	88.0%

Table 2: Relative prevalence of different parasites recovered from coprological examination in relation to body condition scores.

Body condition					
Parasites identified	**Prevalence**	**Poor**	**Good**	**X^2**	**P~ value**
P.equorum	126(32.8%)	35%	31.2%	0.595	0.44
Strongyle	116(30.2%)	28.8%	31.2%	0.277	0.599
D. arnfieldi	18(4.7%)	5.6%	4.0%	0.540	0.463
O.equi	43(11.2%)	10.0%	12.1%	0.396	0.529
Triodontophorus	158(41.1%)	43.8%	39.3%	0.768	0.381
Anoplocephala	6(1.6%)	0.6%	2.2%	1.567	0.211

Table 3: Prevalence of parasites in relation to age of the animal.

Ages					
Parasites Identified	**Young**	**Adult**	**Old**	**X^2**	**P~value**
P.equorum	60.3%	27.8%	25.9%	28.445	0.000
Strongyle	25%	32.5%	29.9%	1.318	0.517
D. arnfieldi	7.4%	3.6%	4.8%	1.572	o.456
O.equi	7.4%	11.8%	12.2%	1.242	0.537
Triodontophorus	36.8%	39.6%	44.9%	1.551	0.461
Anoplocephala	0.0%	1.8%	2.0%	1.348	0.510

Table 4: Prevalence of parasites in relation to sex.

Sex				
Parasites identified	**Female**	**Male**	**X^2**	**P-value**
P.equorum	50%	29.5%	9.908	0.002
Strongyle	29.0%	30.4%	0.049	0.826
D. arnfieldi	4.8%	4.7%	0.004	0.951
O.equi	8.1%	11.8%	0.730	0.393
Triodontophorus	41.9%	41.0%	0.019	0.890
Anoplocephala	0.0%	1.9%	1.174	0.279

Discussion

The results of this study confirm that helminthes infections are highly prevalent in horses of in and Around Ambo town, central Ethiopia. A greater proportion of sampled horses were found infected with various helminthes parasites and the results were consistent with the findings of other studies. The overall prevalence of different types of helminthes eggs and helminthes species in this study were 94%, which is in line with previous report from Ethiopia by [37] in horses of Arsi-Bale highlands of Oromiya Region and [38] in Turkey who reported prevalence of 84.4% and 100%, respectively.The prevalence of *parascaris equorum* was 32.8%.This finding contradicted with the reports of [39] in Arsi Bale highlands of Oromia region, [29] in the tropical weather conditions of Ethiopia, [40] in Pakistan, [38] in Turkey, [28] in Ethiopia highlands who reported 11.7%, 16.2%, 12%, 10.81% and 17.1% respectively. The current finding were relatively higher than the previous finding mention, this could be due to variation in management condition and implementation of parasite control options like regular deworming. This study showed that the level of *parascaris equorum* infestation had no significant variation between the body condition scores. The prevalence of *P. equorum* was significantly higher in young horses (60%) than older horses (25.9%). This was expected because *P. equorum* mostly a problem of young horses as immunity develops following exposure during older age [25].

Acquired resistance to *P. equorum* usually develops before the second year of life and therefore, cases are highly reported from younger animals [25]. Young animals were seem to more susceptible than adults. The prevalence of *P. equorum* was also higher in mares (50%) than their counterpart stallions (29.5 %). This can be justified by the fact that mares have a close relation to their foals, which favors frequent recycling of the parasite between the dam and foal. Heavy infections of *P. equorum* cause impaction and perforation leading to fatal peritonitis [25]. Prevalence of *Dictyocaulus arnfieldi* 4.7%was recorded in the present study that is higher than report of [37], with prevalence of 0.5% and in line with [40] in Pakistan with prevalence of 2.5%. Climatic and environmental differences between countries and differences in access to drugs may partly explain the variation in these estimates. The prevalence of Dictyocaulus arnfieldi didn't show statistically significant variation between the age, sex and body condition scores.The prevalence of Triodonthophorus species in this study (41.1%) was higher than previous findings of [41], [37] and [10]. Who reported 23%, 13.9% and 35% respectively. The possible explanation for the observed variation in prevalence could be attributed to differences in agro-ecology, sampling season as well as equine management system. The prevalence of *Triodonthophorus* species didn't show statistically significant variation between the age, sex and body condition scores. Lower prevalence of *Anoplocephala s*pecies 1.6% recorded in this study as compared to reports by [42,43] might reflect the seasonality of orbited mite intermediate hosts and differences in study period and locations. The low prevalence also could be due to the sporadic discharge [44] of gravid segments in the feces and the difficulty of detecting the eggs of cestodes by routine fecal examination.

Conclusion and Recommendation

Equines are important in the livelihood of developing countries especially in Africa, particularly for transportation. In this study, 6 types of helminthic parasites (*Strongyles, Triodontophorus, P.equorum, D. arnfieldi, O.equi and Anoplocephala*) were found in and around Ambo town, with an overall prevalence of 96%. The predominant parasites occurring in the study area was *Triodonthophorus* with the prevalence of 41.1% followed by *Parascaris equorum* with the prevalence of 32.8%. The study confirmed that among the different age groups old horses were found to be most susceptible and severely infested. This study also confirmed that helminthes parasites are more prevalent in animals with poor body condition than well-conditioned animals. From this study it can be concluded that age and body condition can be considered as one of the important factors which influence the occurrence of some helminthes parasites in horses.

From the above findings of this study, it is highly recommended that

1. Proper screening and monitoring of the horses should be carried out regularly in the horses
2. Implement strategic deworming programs.

Furthermore, parasitic control and prevention should be implemented in the area.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2023.54.008483

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