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# STUDY ON PREVALENCE AND INTENSITY OF STRONGYLE NEMATODE INFECTIONS IN WORKING DONKEYS IN AND AROUND ADET TOWN, YILMANA DENSSA WOREDA, ETHIOPIA.

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## ABSTRACT

A cross sectional study was conducted in and around Adet town, Yilmana Densa Woreda from November 2013 to April 2014 to estimate the prevalence and severity of Strongyle nematode infection in working donkeys. A total of 384 faecal samples were collected randomly from donkeys in the study area for quantitative fecal analysis. The overall prevalence of Strongyle infection in study donkeys was 96.4% (370/384). The prevalence of Strongyle infection was 97.3%, 97.1% and 92.2% in young, adult and old animals, respectively. Jacks and Jennies were observed to have Strongyle prevalence of 95.6% and 96.9%, respectively. However, age and sex have no statistically significance difference (P>0.05) with prevalence of Strongyle infection. Mean of egg per gram of faces in young donkeys is significantly higher (P=0.000; F=18.949) than adult and old donkeys. Majority of working donkeys in the study area suffered from severe infection (43.24%) followed by high infection which is 20.81%. The overall worm count ranges from 100-3500 with a mean of 1423.73 worms per donkey. Deworming frequency has been observed to inversely affect severity of parasitic infection. In the current study, body condition score was not good indicator of level of parasitism in the study animals. The result of the current study has demonstrated a high prevalence of Strongyle infection in working donkeys which could contribute to their low work performance and shorter life expectancy. It is suggested that well designed strategic deworming program with better veterinary service for equines, coupled with building the awareness of livestock owners regarding impact of parasites on donkeys should be the steps to take urgently.

**KEYWORDS**: *Adet town, Donkey, Prevalence, Strongyle.*

## 1. INTRODUCTION

Ethiopia is located in East Africa, which is predominantly agricultural country having diverse agro-ecological zones which contributed to the evolution of different agricultural production systems. Animal production is practiced in all zones of the country (Tegegne and Carawford, 2000; Ayele and Dinka, 2010). The domestic donkey belongs to the genus Equus and family equidae. It is believed that all the domestic donkeys in the world are descended from African wild ass (Fielding and Krause, 1998). Currently there are about 112.5 million domestic equidae in the world of which 44.3 million donkeys, 58.5 million horses and the remaining are mules (FAO, 2013). In Ethiopia there are about 6.75 million donkeys being the second largest donkey population in the world next to China, 0.35 million mules and 1.91 million horses (CSA, 2013). Equines play an important role in socio-economic development by providing drought power. In Ethiopia the country's topography is not suitable for modern transportation system; this makes equines area choice to cover transport needs especially in rural areas (Abayneh *et al*., 2002). They transport a huge diversity of loads ranging from people, agricultural produce, food and water, building materials, such as timber, stone, bricks and even iron sheets. They have multiple functions, which are not limited to economic aspects, but are also related to socio- cultural issues. Donkeys also have been used in land tillage in areas where the soil is losses and assist in threshing and trampling (Getachew *et al*., 1991; Abayneh *et al.*, 2002).

Long working hours and difficult conditions are experienced by donkeys. They are often engaged in working for long hours and when they get free, they are left to browse and feed on garbages. These have the potential to affect negatively their welfare and their quality of life (Yilma *et al.*, 1991). Moreover, equines are vulnerable to an array of disease of biological origin and commonly to parasitism (Lyons *et al*., 2000). Among these parasites, Strongyle nematode takes a greatest share. These parasites are the most ubiquitous and live as adults in the large intestine of equines. Strongyle nematodes of equines are classified in two subfamilies which are Strongylidea and Cyathostominea and are categorized as large and small Strongyles, respectively (Hendrix, 1998; Lichtenfes *et al*., 2002). Large Strongyle species are most devastating and harmful parasites of equines due to their migratory habit and also they can be seen in all age groups of equines except in very young foals which have not started grazing (Urquhart *et al.*, 1996). This genus composed of three important species namely *S. vulgaris*, *S. edentatus* and *S. equines* (Urquhart *et al.*, 1996; Zerihun, 2008). These parasites cause lowered fertility, reduce working capacity, increased treatment cost, reduce

power output, poor reproductive performance as well as short life span (Krecek and Mathee, 2002). Among the three large *Strongylus* species *S. vulgaris* is the most pathogenic parasite in equine, causing unthriftness, weakness, and increased susceptibility to other infections and even death from fatal colic (Khallaayoune, 1991). The genus Triodontophorus is the other genus of subfamily Strongylidea consists of medium sized worms and is non migratory large Strongyles which frequently occur in large numbers in the colon and distribute to the deleterious effect of mixed Strongyle infection (Feseha, 2003). The common species of this genus are *T. serratus, T. tenuicolis, T. brevicauda* and *T. minor*. The pathogenic effect of these worms are damage to the large intestinal mucosa due to the feeding habits of the adult parasites, in particular *T. tenuicollis* whose adults feed in groups and cause the formation of large deep ulcer. There is deep extending muscular mucosa and parasites are found attached to the periphery of the lesion (Hosseinni *et al*., 2009).

Over 40 species of small Strongyles in several genera have been found in the cecum and colon of domestic equids, each of which with a site of preference (Feseha, 2003). Recently the genus Trichonemine has been discarded and replaced by four genera namely Cyathostomum, Cyclicocyclus, Cylicodontophorus and Cyclistephanus are collectively known as cyathostomes (Urquhart *et al.*, 1996; Radostitis *et al*., 2007). There are two sources of Strongyle parasitic infection during grazing season in temperate area. Firstly, there are infective larvae which developed during the previous grazing season and have survived on pasture over winter. Secondly and probably, more important sources of infective larvae are the eggs passed in the current grazing season by horses including nursing mares sharing the same grazing area. Pasture larvae levels increased markedly during the summer months when conditions are optimal for rapid development of eggs to L3. The rate of hatching is directly proportional to the environmental temperature (Radostitis *et al*., 2007).

The main clinical sign attributed to Strongylosis are unthriftness, weight loss, poor growth, anemia (low number of blood cells), diarrhea and intermittent constipation and colic (Mohamed, 1991; Radostitis *et al*., 2007). Diagnosis of this parasite is based on the grazing history and a clinical signs. Finding of typical thin shelled Strongyle type eggs which contain 8-16 cell morula in fecal examination is useful aid to diagnosis of these parasites (Hendrix, 1998; Urquhart *et al., 1996*).

There are number of broad spectrum anthhelimthics to treat Strongyle nematode parasites which includes benzimidazole, pyrantel and ivermactine which are important in removing

lumen-dwelling adult and larval parasites and these are usually marketed as in feed or oral preparation (Deprez and Vercruysse, 2003). The control approaches of helminth infections in domestic equidae includes: use of anthelmintics (destroy the parasites in the final host), improved managemental practices (pasture management approach), improving resistance of host status (vaccination of animals) and Sanitation and good management offers control of round worms (Radostits *et al*., 2007). Since horse of any age can be infective by excreted eggs as result all grazing animals over 2 months of age should be treated every 4-8 weeks with effective broad spectrum anthelmintics. Any animal joining a treated group should be receives anthelmintics and be isolated for up to 72 hours. If it is possible paddock rotation system should be adopted so that nursing mares and foals do not grazed at the same grazing areas in successive years (Urquhart *et al*., 1996; Marquqrd *et al*., 2000). Infections of working donkeys with gastro-intestinal parasites particularly Strongyle nematode parasite infections are recorded from most countries of Africa and a few parts of Ethiopia. In Ethiopia, few studies have been done in central and Eastern parts of the country (Feseha, 1998) and information on the epidemiology of strongyle infection in donkeys of in and around Adet town, Yilmana Denssa woreda is at scares. Therefore, the current study was conducted to estimate the prevalence and the intensity (burdens) of Strongyle nematode infections and to assess the effect of deworming frequency on Strongyle nematode infection in working donkeys in the study area.

## 2. MATERIALS AND METHODS

### 2.1. Study Area

The current study was conducted from November 2013 to April 2014 in and around Adet town, Yilmana Denssa Woreda. The area is found south of Bahir Dar in Mirab Gojjam Zone of Amhara National Regional State. Adet town is located at a latitude of 11°16′N and longitude of 37°29′E having an altitude of 2216 meters above sea level. The mean annual temperature and average annual rainfall is 20.5°C and 1687mm, respectively (NMABB, 2013).

### 2.2. Study Animals

The study has considered randomly selected donkeys for fecal sampling to estimate the presence of Strongyle infection. According to AARDO, 2013 report there are 22,487 equine populations in the study area and donkey population accounts 19,552 (86.95%). Sampling has been performed irrespective of age, sex and body condition scores of donkeys in the study

area. Age and BCS have been determined according to (Svendsen, 1997) (Annex 1 and 2). Donkeys were grouped in to three age categories. Donkeys under 2.5 years of age were classed as young, those in range of 2.5 to ten years were classed as adult and those beyond ten years were classed as old Tesfaye *et al*. (2006).

### 2.3. Study Design and Methodology

A cross sectional study design was employed to investigate the epidemiology of Strongyle infection through coprological examination in donkeys dwelling in study area. Accordingly, simple random sampling was utilized to select the study animals.

#### *2.3.1. Sample size determination*

The sample size was determined based on the formula given by Thrusfield (1995).

$$n = \frac{1.96^2 \times Pexp\ (1- Pexp)}{d^2}$$

Where,

n = sample size required

Pexp = expected prevalence (50%)

d = desired absolute precision (5%)

Therefore, a total of 384 donkeys were selected randomly for fecal sampling.

#### *2.3.2. Faecal sample collection and coprological examination*

Fecal samples have been collected directly from the rectum of the animal using disposable or rectal gloves and placed in universal bottles which contained 10% formalin. Each sample was properly labeled with animal identification (age, sex, BSC), owner's name, date with permanent pen and transported to Bahir Dar Regional Veterinary Laboratory for examination. The floatation technique was employed to concentrate Strongyle parasite eggs in the faeces and was examined microscopically (10x) for presence of parasite ova. Sodium chloride solution was used as flotation fluid (Annex 4). Identification of the eggs was made on the basis of their morphology according to Soulsby (1982) and Urquhart *et al*. (1996) and the intensity of infection was determined through Mc Master Method; number of parasite eggs per gram of feces was quantified according to the standard procedures given by MAAF (1979); Soulsby (1982) and Urquhart *et al*. (1996) (Annex 3).

### 2.4. Data Analysis

The collected raw data has been properly coded and entered into Microsoft Excel, 2007 work sheet. Then the data has been transferred to SPSS 20 version for windows package for statistical analysis. Prevalence of Strongyle infection and other descriptive statistics were made. Pearson's Chi-square test was used to test the significance for any association between Strongyle infection and independent variables at probability levels of 0.05 (P<0.05).

One Way ANOVA has been made to test the trend of mean EPG among age and deworming status groups. The results of the analysis have been presented with illustrative figures and tables. In all cases 95% confidence interval (CI) and P< 0.05 was considered for statistically significant difference.

## 3. RESULTS

Coprological examination of fecal samples from 384 donkeys has revealed an overall prevalence of 96.4% (n=370) for Strongyle infection. Accordingly, the prevalence of Stronglye infection in young, adult and old animals was 97.3%, 97.2% and 92.2%, respectively. The prevalence in jacks and Jennies was 95.6% and 96.9%, respectively. However, there was no statistically significant difference (P >0.05) in Strongyle infection among age, sex and body condition score groups (Table 1). There was statistically significance difference (P=0.001; F=18.949) between age groups for the mean egg per gram of feces (Table 3). Deworming frequency with ivermectin had statistically significant association (P<0.05) with prevalence of Strongyle infection and mean EPG count (Table 2 and 5**)**.

**Table 11: Prevalence of strongyle infection among age, sex and BSC groups of donkeys**

| Risk factors | Number of animals examined | Number positive | Prevalence (%) | P value |
|---|---|---|---|---|
| Age | | | | |
| Young | 110 | 107 | 97.3 | 0.150 |
| Adult | 210 | 204 | 97.14 | |
| Old | 64 | 59 | 92.2 | |
| Sex | | | | |
| Male | 160 | 153 | 95.6 | 0.519 |
| Female | 224 | 217 | 96.9 | |
| BCS | | | | |
| Poor | 14 | 14 | 100 | 0.524 |
| Moderate | 319 | 307 | 96.24 | |
| Good | 51 | 49 | 96.08 | |

P>0.05

There was no statistically significance difference (P =0.150; 0.519 and 0.524) in Strongyle infection among age, sex and body condition score groups, respectively

**Table 2: Association between prevalence of Strongyle infection and deworming frequency**

| Frequency of deworming | Number of examined animals | No. of positives | Prevalence (%) |
|---|---|---|---|
| Never been dewormed | 184 | 184 | 100 |
| Infrequent (occasional) | 170 | 168 | 98.8 |
| Every six months | 30 | 18 | 60 |

P=0.001.

As illustrated in Table 2 above, there was statistically significant difference (P=0.001) in Strongyle infection among the different deworming status of donkeys. Hence, Strongyle infection was significantly higher in those donkeys which have never been dewormed before (100%) followed by those which are occasionally dewormed (98.8%). Donkeys which have been benefited from the regular six month deworming program were only with 60% infection.

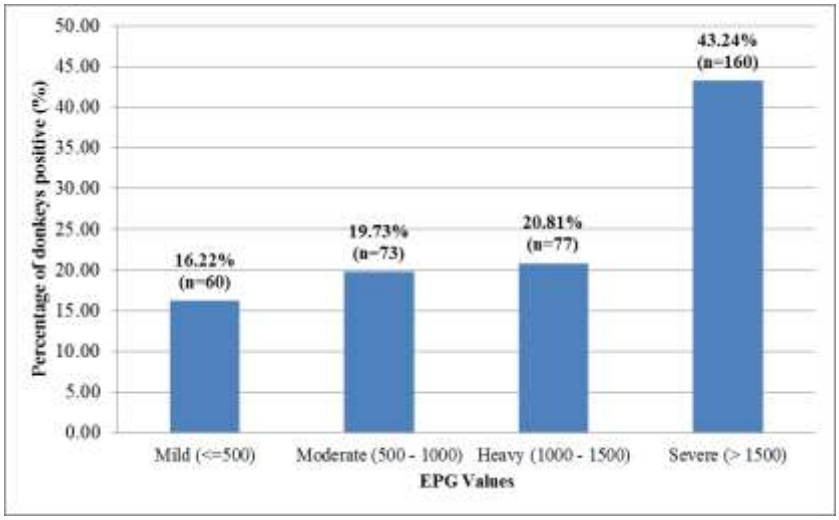


**Figure 1: Severity of Strongyle infection determined by EPG count**

The above figure indicates level of strongyle infection or burden as determined from fecal egg count and percentage of donkeys positive for each infection level at four different infection level (low, moderate, high and sever)

**Table 3: Severity of Strongyle infection based on age of donkeys**

| Age | Severity of infection | | | | Total |
|---|---|---|---|---|---|
| | Low | Moderate | High | Severe | |
| Young | 2.8%(3) | 6.5%(7) | 32.7%(35) | 57.94%(62) | 107(100%) |
| Adult | 21.1%(43) | 23%(47) | 15.7%(32) | 40.2%(82) | 204(100%) |
| Old | 23.7%(14) | 32.2%(19) | 16.9%(10) | 27.1%(16) | 59(100%) |
| Total | 16.2%(60) | 19.7%(73) | 20.8%(77) | 43.2%(160) | 370(100%) |

**Table 4: The overall mean eggs per gram of feces of Strongyle infection among three age groups of donkeys.**

| Age | No of positive cases | Mean ± SD | 95% CI | Minimum | Maximum |
|---|---|---|---|---|---|
| Young | 107 | 1785.14 ± 646.287 | (1661.27 - 1909.01) | 300 | 3500 |
| Adult | 204 | 1317.94 ± 804.013 | (1206.94 - 1428.93) | 100 | 3500 |
| Old | 59 | 1134.06 ± 727.106 | (944.58 - 1323.55) | 200 | 2900 |
| Total | 370 | 1423.73 ± 784.979 | (1343.48 - 1503.97) | 100 | 3500 |

P < 0.001; F=18.949

As illustrated in Table 3 above severe and heavy strongyle infections were significantly more common in young donkeys while those low and moderate cases were common in elders. Similarly, young donkeys were with significantly higher mean epg (1785.14 ± 646.29) than adult (1317.94 ± 804.01) and old donkeys (1134.06 ± 727.11) (P = 0.001; F=18.949) (Table 4).

**Table 2: Association between deworming frequency and degree of infestation**

| Deworming status | No. of positive cases | Mean± SD | 95% CI | Minimum | Maximum |
|---|---|---|---|---|---|
| Never | 184 | 1705.29±610.352 | (1616.27 -1794.32) | 300 | 3500 |
| Infrequent | 168 | 1191.18±821.355 | (1066.45- 1315.91) | 200 | 3500 |
| Every six month | 18 | 744.44±916.658 | (288.6- 1200.29) | 100 | 3100 |
| Total | 370 | 1423.73±784.979 | (1343.48- 1503.97) | 100 | 3500 |

P = 0.000; F=31.205

Deworming status (frequency) was significantly association (P=0.000; F=31.205) with severity of Strongyle infection. Those donkeys which have never been dewormed before were significantly with higher mean EPG value (1705.29±610.35) than those donkeys which have been benefited by occasional (1191.18±821.36) or frequent (744.44±916.66) deworming scheme.

## 4. DISCUSSION

The present study has showed a high prevalence of Strongyle infection (96.4%) in working donkeys in the study area. This finding is in agreement with previous findings done by Yoseph *et al*. (2001); Fikru *et al*. (2005); Mulate (2005); Ayele *et al*. (2006); Wubishet (2008); Getachew *et al*. (2009) and Zerihun *et al*. (2011) who reported an approximate prevalence of 100% in donkeys in different parts of Ethiopia. Also Tola *et al*. (2013) reported a prevalence of 87.8 % in Gondar Town which was in line with the current study. This is most probably attributed to the lack of intervention with proper anthelmintics and also animals share the same grazing pasture throughout the year. The current high Strongyle prevalence also agrees with several previous reports from different parts of the world (Eysker and Pandey, 1989; Lyons *et al*., 2000; Matthee *et al*., 2002; Bu *et al*., 2009). The current finding is relatively higher than the findings made by Basaznew *et al*. (2011); Endalkachew and Bewketu (2013) who have reported 82.7%; 65. 09% in and around Bahir Dar, respectively. This relative difference in strongyle prevalence might be due to strategic deworming practices exercised by donkey sanctuary Ethiopia Amhara project in and around Bahir Dar.

There was no any significant difference (P>0.05) in Strongyle infection among sex groups and gender does not seem to play a role in this regard. Similar finding has been reported by other researchers under different management and climatic conditions (Zerihun, 2008; Ayele and Dinka, 2010; Basaznew *et al*., 2011; Zerihun *et al*., 2011 and Tola *et al*., 2013).

Data on age related prevalence indicates no statistically significant difference (P>0.05) among various age groups. Previous researchers also reported similar results (Zerihun, 2008; Ayele and Dinka, 2010; Basaznew *et al*., 2011; Zerihun *et al*., 2011; Tola *et al*., 2013 and Bewketu and Endalkachew, 2013). In contrary Chitra *et al.* (2011) reported that the level of Strongyles and Ascarids increased when the donkey became older. It may be due to the development of immunity with age against Strongyles and Ascarids.

The current finding has showed that there is no any significant association between body condition scores and level of Strongyle infections. Similar observations were reported by previous investigators (Basaznew *et al*., 2011 and Tola *et al*., 2011). This finding was also in agreement with the work of Zerihun, 2008 and Ayele and Dinka, 2010 who reported poor association between BSC and prevalence of strongyle infection. In contrary other researchers have indicated association between BSC and prevalence of Strongyle infection (Matthee *et*

*al*., 2002; Fikru *et al*., 2005; Ayele *et al*., 2006; Brady and Nichols, 2009; Getachew *et al*., 2009; Zerihun *et al*., 2011 and Endalkachew and Bewketu, 2013). This might be due to increased land cultivation which restricts animals on small communal grazing land resulting in continuous exposure (Ayele and Dinka, 2010; Ibrahim *et al*., 2011).

The study revealed that majority of the donkeys (43%, n=160) had severe infection with Strongyles which is consistent with the finding of Getachew *et al.* (2008a); Getachew *et al*. (2010) and Zerihun *et al*. (2011). Analysis of degree of infection among age groups has indicated that severe and heavy Strongyle infections were more common in young donkeys while those low and moderate cases were common in elders. This finding is in agreement with the previous research of Matthee *et al*. (2002); Getachew *et al*. (2009) and Zerihun *et al*. (2011). It is may be due to the less developed immunity against helminthes in young donkeys than both adult and old ones.

The highest mean strongyle egg count was recorded in young donkeys. This finding is in agreement with previous studies done by Ayele *et al*. (2006) and Zerihun *et al*. (2011). The finding of higher prevalence and mean EPG of Strongyles in young donkeys may be due to lack of immunity to these parasites (Uslu and Guclu, 2007). In the current study, the mean EPG count of Strongyle was found to be 1423.73 in donkeys. The finding was slightly lower than the report of Ayele and Dinka (2010) and Seri *et al.* (2004) who reported mean EPG count of 2893 in central Shoa, Ethiopia and Sudan, respectively. This is may be due to differences in equine management and agro-climatic conditions between the study areas.

Deworming frequency had significant association (P=0.001) with prevalence of Strongyle infections. Those donkeys which have not been dewormed and those with occasional access were with 100% and 98.8% prevalence, respectively. Donkeys which were dewormed regularly had relatively lower prevalence and severity of infection. Deworming frequency was significantly association (P=0.000; F=31.205) with mean EPG of Strongyle infections. This is in agreement with the report of Zerihun (2008) and Ayele and Dinka (2010). This reduced prevalence might be because of decreased pasture contamination by the dewormed donkeys.

## 5. CONCLUSION AND RECOMMENDATIONS

The present study has showed that a high prevalence of strongyle parasites that may play great role in affecting the health and welfare of donkeys in the study area. The observation of

high prevalence and egg count per gram of feces suggested that the presence of favorable conditions for survival, infection and perpetuation of this parasite of donkeys in the study area. The study clearly showed that donkeys of all age groups, sex and BSC were affected by Strongyle parasites. Severity of strongyle infection for working donkeys is significantly affected by age and deworming frequency while sex and BSC may not reflect the degree of parasitic burden in the study area. Lack of effective veterinary service and poor awareness of animal welfare has exacerbated or aggravate prevalence of parasite in working donkeys in the study area. There is urgency for a comprehensive strategy in improving the health and welfare status of working donkeys, involving community based awareness creation coupled with placing access to reliable veterinary service to working equines. There is a need for strategic deworming schemes to be part of animal health improvement plans. Furthermore, researches with a wider scope and objectives in the area of major parasitic diseases of working donkeys in particular and equine at large are required prior to intervention plans.

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