Study on the Prevalence of Strongyle Infection in Donkeys in and around Assosa Town, Benishangul-Gumuz Region, Western Ethiopia

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Abstract: A cross sectional study was conducted from March 2019 to May 2019 in and around Assosa town to determine the prevalence of strongyle infection and to assess its associated risk factors in the study area in donkeys. A total of 200 animals were randomly selected from five different peasant associations in the study area and examined during the study period. Coprological examination for the detection of strongyle eggs was performed using floatation technique. The overall prevalence of strongyle parasites was 30.5% (61 from 200 donkeys). The study has also showed variation in prevalence of strongyle parasites among different body condition scores and between ages, higher prevalence was recorded in poor body condition (83.72%) and old (46.15%), respectively. In relation to selected peasant association the prevalence were found 38.88%, 32%, 23.52%, 17.64% and 30%, for Assoa 01, Assosa 03, Amba 4, Amba 5 and Amba 8, respectively. The risk factors, age and body condition, were significantly associated with the occurrence of strongyle parasites (p<0.05). In conclusion the current study revealed that stronglosis was found to be the major problem in the study area; hence strategic deworming and minimizing overworking and extensive open grazing should be implemented to reduce contamination.

Key words: Assosa, Donkey, Prevalence, Risk factor, Strongylosis

1. Introduction

Ethiopia is a country naturally gifted with huge natural resources occupied different agro-ecological zones and suitable environmental conditions; this makes Ethiopia home for many livestock species and suitable for livestock production. The country is believed to have the largest livestock population in Africa with estimated livestock population 59.5 million cattle, 56.53 million heeds of chicken, 30.70 million sheep, 30.20 million goat, 8.44 million donkeys, 2.16 million horses, 1.21 million camels, and 0.41 million mules, are widely distributed across the different agro-ecological zones of the country (CSA, 2017).

Equines (donkeys, mules, and horses) play an important role as working animals in many parts of the world, employed for packing, riding, carting, and plowing. Equine power is vital for both rural and urban transport system which is cheap and provides the best alternatives in places where the road network is insufficiently developed (Getachew et al., 2008).
Strongyle nematodes are important equines gastrointestinal parasite species, belongs to the Superfamily Strongyloidea, family Strongylidae, genus *Strongylus* and comprising of three species *S. vulgaris*, *S. edentatus*, and *S. equines*. These parasites are ubiquitous and live as adults in the large intestine of equids (Bariisoo and Wubit, 2016).

### 2.1. Etiology

Members of the genus *Strongylus* live in the large intestine of horses and donkeys and, with Triodontophorous, are commonly known as the large Strongyles (Taylor et al., 2007). Horses, asses, and mules host a far greater variety of Strongylide parasites than ruminants and other domestic animals do. Even an apparently healthy horse may be infected with tens or even hundreds of thousands of small Strongyle worms (cyathostominae) (Bowman, 2003). The *Strongylus* species found in equines are *S. vulgaris*, *S. edentatus* and *S. equines* (Belayet al., 2016).

### 2.2. Morphology and Identification

*Strongylus* parasites are robust dark red worms which are easily seen against the intestinal mucosa. The well-developed buccal capsule of the adult parasite is prominent, as is the bursa of the male. Male are 2.3-2.8 cm in size and females 3.3-4.4 cm and the head end is wider than the rest of the body. Male are 2.6-3.5 cm in size and females 3.8-4.7 cm and the head end is not marked of from the rest of the body and Male are 14-16 mm in size and females 20-24 mm and the head end is not marked of from the rest of the body are atypical features of *S. edentates*, *S. equines* and *S. vulgaris*, respectively (Taylor et al., 2007).

Species identification is based on size and the presence and shape of the teeth in the base of buccal capsule. *S. vulgaris* has two ears shaped, rounded teeth and *S. equines* possess three conical teeth, and one is situated dorsally and is larger than the others whereas *S. edentates* has no teeth (Belay et al., 2016).

### 2.3. Life Cycle

*Outside the donkey*: Strongyles live as adults in the large intestine (cecum, ventral colon, and dorsal colon) of the donkey and horse and lay eggs that are voided in the feces. In the environment, an egg embryonates to the first stage larva (L1) which hatches and then develops to the second stage larva (L2), and finally to the third stage larva (L3) which is the infective stage. The L1 and L2 feed on organic matter, but the L3 does not feed but subsists on internal nutrients. The L3 is the infective stage which typically crawls up on pasture vegetation, especially under moist conditions which make movement easier than dry situations, and is then accidentally ingested by the grazing horse. Inside the donkey the L3 develops to

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**Performance and most of all their longevity** (Tamador et al., 2011).

Endoparasites are those parasites that live within the body of the host (Heinemann, 2001). Numerous internal parasites are known to infect equines. These include roundworms mainly of strongyle, flukes, tapeworm, protozoan and fly larvae that infest and damage the intestine, respiratory system and other internal organs (Pereira and Vianna, 2006; Taylor et al., 2007; Alemayehu and Etaferahu, 2013).

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the fourth (L4) and then fifth (L5) (adult) stage (Hendrix, 2006).

Inside the donkey: Within the genus Strongylus are three species S. edentatus, S. equinus and S. vulgaris. These species are the most pathogenic of the strongyles because they can cause colic and even death of donkeys. Strongylus vulgaris is the most damaging of the three species. Detrimental effects of these parasites usually are most evident during migration of immature stages in organs outside the gastrointestinal tract (Taylor et al., 2007).

Strongylus vulgaris highlighted because it is the most pathogenic parasitic nematode species in donkeys and horses. When L3 are ingested they penetrate the intestinal mucosa, mainly of the posterior part of the small intestine, cecum, and ventral colon, and enter arterioles in the walls of these organs. About two weeks later they begin arriving and accumulating primarily in the cranial mesenteric artery (CMA). There they undergo development to the L4 and L5 (Lefevre et al., 2010).

2.4. Epidemiology

Equine Strongyle species infection occur specifically in domestic equines, i.e., horses, donkeys and their hybrids, but they are also frequently found in large numbers in zebras. The host is important in terms of susceptibility to disease with the horse being the most susceptible to infection and disease especially through bred horses (Lefevre et al., 2010). Strongylosis is a common disease of horses throughout the world and causes deaths when control measures are neglected. In areas with cold winters and mild summers, egg deposition peaks in spring and remains high over summer. At this time, temperatures are suitable for larval development and massive infective larvae may occur in late summer and early autumn, when young susceptible donkeys are present (Saeed et al., 2010). Strongylosis most frequently a problem of in young horse pastures, although cases of severe disease may occur in adult animals kept in sub urban paddocks and subjected to overcrowding and poor management (Armour et al., 1996).

2.5. Pathogenesis

The disease processes associated with the Strongylus can be divided in to those produced by migrating larvae, those provoked by the mass emergency of mucosal larvae and these associated adult worms. Heavy intestinal infection can alter intestinal motility, intestinal permeability and carbohydrate absorption (Radostitis et al., 2007). The larvae of S. vulgaris are the most pathogenic, causing arthritis, thrombosis and thickening of the wall of the cranial mesenteric artery. Emboli may break away and lodge in smaller blood vessels, leading to partial or complete ischemia in part of the intestine, thus producing colic. The result of this depends on the length of the segment of the intestine affected and the ability of the collateral blood supply to become established before necrosis and gangrene occur (Taylor et al., 2007). The disease is due to migrating S. vulgaris larvae that are responsible for verminous arthritis. In case of massive infection, the clinical picture is severe with rapid weight loss; liquid diarrhea and frequent bouts of severe colic (Lefevre et al., 2010).

2.6. Clinical Findings

The clinical picture varies in line with the intensity of parasite burden, the prevalence of certain parasitic species, and to the stage of development of the worms. Moderate infections due to larvae stages or adult worms result in sub clinical or chronic diseases with general clinical signs among which weight loss is the most common (Lefevre et al., 2010). Grazing horses usually carry a mixed burden of large and small Strongyles and the major signs associated with heavy infection in animals up to 2-3 years of age are unthriftiness, anemia, colic and sometimes diarrhea (Hendrix, 2006). Marked clinical signs are less common in older animals although general performance may be impaired (Belay et al., 2016). The effect of Strongyle species in more chronic infestation results persistent low grade fever, poor appetite, intermittent colic and poor weight gain (Radostitis et al., 2007).

2.7. Diagnosis

Diagnosis of mixed Strongyle species infection is based on demonstration of eggs in the feces. Strongyle species eggs are oval, and thin shelled and are most of them observed during standard fecal flotation of faeces (Hendrix, 2006). A specific diagnosis is difficult to achieve in every case. Few clinical observations or laboratory results are pathognomic for the disease syndromes associated with Strongyle species infection. Often a judgment has to be made on an overall appraisal of clinical history, presenting signs and laboratory finding (Radostitis et al., 2007). The presumptive diagnosis of strongylosis due to adult worms are appropriate in young animals after weaning and in case of poor body condition, intermittent colic and irregular bouts diarrhea (Lefevre et al., 2010).

2.8. Treatment

Treatment may be targeted against immature and adult large strongyle worms in the lumen of intestine, against migrating Strongyle species larvae particularly S. vulgaris or against cyathostomins larvae, in the intestine mucosa (Radostitis et al., 2007). Anthelmintic, ivermectin and moxidectin at a standard dosage are effective against the larval stages (L4 and L5) of effective against larval infection. A number of anthelmintics including the benzimidazoles, pyrantel, and ivermectin, are effective against adult large Strongyle species (Kahn, 2008).
2.9. Control and Prevention
The goal for control of donkey strongyle infection is to minimized the number of eggs and resultant infective L3 larvae on the grazing areas and there by prevent clinical and sub clinical disease. Environmental contamination by infective larvae is the main determinant to the infective parasite control (Kaufmann, 1996). The concept of preventing parasite contamination of the environment can be accomplished by eliminating egg shedding back into the environment by strategically timed deworming ((Belay et al., 2016)). Regular treatment of all animals including any age group of donkey, starting from the weaners, is typically used to eliminate adult. Strongyle species and these prevent heavy contamination of pastures with eggs and infective L3 larvae (Lefevre et al., 2010).

3. Materials and Methods

3.1. Study Area

The study was conduct in and around Assosa Town, from March 2019 to June 2019. Assosa is the capital city of the Benishangul-Gumuz Regional State and composed of 74 administrative peasant associations, which is located at 8°30’and 40°27’ N latitude and 34°21’ and 39°1’ E longitude 687kms Northwest of Addis Ababa (CSA, 2015). The altitude of Assosa ranges from 580 to over 1560 meter above sea level. The area is characterized by low land plane agro- ecology which has ‘kola’ micro climate with land covering 2317km² areas, according to National Meteorological Service Agency (NMSA) with average annual rainfall of 850-1316mm with uni-modal type of rainfall that occurs between April and October. Its mean annual temperature ranges between 16.75 °C and 30 °C. Assosa zone has 35.6% of the livestock population of the region constituting 61, 234 cattle, 19,729 sheep, 25,137 donkeys, 439,969 poultry and 73,495 beehives (CSA, 2015).

3.2. Study Population

The study populations were apparently healthy indigenous breeds of Donkeys managed under the traditional husbandry system and animals kept mainly for traction, transport and cart pulling in which samples taken from five different Peasant associations (Assosa 01, Assosa 03, Amba 4, Amba 5 and Amba 8).

3.3. Study Design and Sampling Technique

A cross-sectional study was carried out from March 2019 to June 2019 to determine the prevalence of strongyle parasites in donkeys. Purposive sampling technique was employed as sampling strategies used to collect all the necessary data from Assosa town and the surrounding areas of the study animals.

3.4. Sample Size Determination

The Sample size required for the study was determined using the formula given by Thrusfield (2007) since there was no previous works on the prevalence of stongyle infection in donkey. To calculate the sample size, 95% confidence level, 50% expected prevalence and 5 % of desired absolute precision (d=0.05) was used.

\[ n = \frac{Z^2 \cdot P \cdot (1 - P)}{d^2} = \frac{(1.96)^2 \cdot 0.5 \cdot (1 - 0.5)}{(0.05)^2} = 384 \]

Where; n is the sample size, Z (1.96) is the statistic corresponding to level of confidence 95%, P is the expected prevalence and d is precision which was taken as 5%. Therefore, a total of 384 samples were needed to conduct the research, but only 200 samples were collected due to shortage of time.

3.5. Study Methodology

Details about sex, age and body condition of the study animals were gathered appropriately. Animals
examined were also grouped into three age groups as young (<4 years), adult (4-9 years), old (>9 years) by dentition according to the modified method described by Crane (1997). The body conditions were scored following the guideline set by Svendsen (1997) as poor, medium, and good.

3.6. Sample Collection and Examination

Fresh fecal sample were collected randomly from donkeys from selected sites in and around Assosa town. The samples were collected directly from the rectum using disposable plastic gloves and during defecation when circumstance allow and placed into universal bottles. Each sample was labeled with necessary information and immediately transported to Assosa University department of veterinary science parasitology laboratory. Samples were kept in refrigerator at 4°C when immediate processing was not possible. But, it was processed within 48 hours. Some samples were held using 10% formalin. Parasitological examination was done by qualitative flotation techniques (Soulsby, 1992) following the standard procedures for nematode parasites and examined microscopically (10× and 40×). Identification of the eggs was made based on the basis of their morphology (Urquhart et al., 2003).

3.7. Data Analysis

All the necessary data were collected and registered precisely. The data obtained at the time of study were classified, entered, filtered and coded using Microsoft Excel® 2010 spreadsheet. Before subjected to statistical analysis, the data were thoroughly screened for errors and improper coding. Then the data subjected to chi-square test in order to assess the association between comparable variables by making use of SPSS version 20 for appropriate statistical analysis. Descriptive statistics was used to calculate prevalence by dividing the number of positive animals to the total number of animals to measure association between prevalence of the parasites, species, body condition, age, origin and sex category of animals.

4. Results

In the present study out of 200 (n=200) donkeys examined 61 were found to be infected with strongyle parasites. So that the overall prevalence of strongyle infection for donkeys out of 200 examined samples was found to be 30.5%. Out of 200 animals sampled 155 were males while the remaining 45 were females having respective prevalence of 46(29.67%) and 15(33.33%) in male and female (Table 2) with no statistical difference between sexes (p=0.639). The prevalence of strongyle infection were found 41.07%, 19.04% and 46.15% in young, adult and old, respectively (Table 2) with statistically significant variation among age groups (P=0.001).

The prevalence of strongyle parasite were 83.72%, 19.6% and 9.09% in poor, medium and good body condition scores, respectively with statistically significant difference among the different body condition scores (P=0.000) (Table 2). The highest prevalence was recorded in poor body condition followed by medium and good. The prevalence of strongyle infection were found 38.88%, 19.72%, 17.64% and 30% in Assosa 01, Assosa 03, amba 4, amba 5 and amba 8, respectively with no statistical difference between the five peasant association (P=0.415) (Table 2).

<table>
<thead>
<tr>
<th>Character</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
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<tr>
<td>Male</td>
<td>155</td>
<td>77.5%</td>
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<tr>
<td>Female</td>
<td>45</td>
<td>22.5%</td>
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<tr>
<td>Age</td>
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<td></td>
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<tr>
<td>Young</td>
<td>56</td>
<td>28%</td>
</tr>
<tr>
<td>Adult</td>
<td>105</td>
<td>52.5%</td>
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<tr>
<td>Old</td>
<td>39</td>
<td>19.5%</td>
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<tr>
<td>Body condition</td>
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</tr>
<tr>
<td>Poor</td>
<td>43</td>
<td>21.5%</td>
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<tr>
<td>Medium</td>
<td>102</td>
<td>51%</td>
</tr>
<tr>
<td>Good</td>
<td>55</td>
<td>27.5%</td>
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<tr>
<td>Peasant association</td>
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<tr>
<td>Assosa 01</td>
<td>54</td>
<td>27%</td>
</tr>
<tr>
<td>Assosa 03</td>
<td>25</td>
<td>12.5%</td>
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<tr>
<td>Amba 4</td>
<td>34</td>
<td>17%</td>
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<tr>
<td>Amba 5</td>
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<td>8.5%</td>
</tr>
<tr>
<td>Amba 8</td>
<td>70</td>
<td>35%</td>
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<tr>
<td>Result</td>
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<tr>
<td>Positive</td>
<td>61</td>
<td>30.5%</td>
</tr>
<tr>
<td>Negative</td>
<td>139</td>
<td>69.5%</td>
</tr>
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</table>
Table 2: Prevalence of strongyle infection according to sex, age, body condition and peasant association of animals.

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Number of examined animals</th>
<th>Number of positive animals</th>
<th>Prevalence (%)</th>
<th>( \chi^2 )</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
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<tr>
<td>Male</td>
<td>155</td>
<td>46</td>
<td>29.67%</td>
<td>0.220</td>
<td>0.639</td>
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<tr>
<td>Female</td>
<td>45</td>
<td>15</td>
<td>33.33%</td>
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<td>Age</td>
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<tr>
<td>Young</td>
<td>56</td>
<td>23</td>
<td>41.07%</td>
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<tr>
<td>Adult</td>
<td>105</td>
<td>20</td>
<td>19.04%</td>
<td>13.958</td>
<td>0.001</td>
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<tr>
<td>Old</td>
<td>39</td>
<td>18</td>
<td>46.15%</td>
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<tr>
<td>Body condition</td>
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<td></td>
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<td>Poor</td>
<td>43</td>
<td>36</td>
<td>83.72%</td>
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<tr>
<td>Medium</td>
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<td>20</td>
<td>19.6%</td>
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<tr>
<td>Good</td>
<td>55</td>
<td>5</td>
<td>9.09%</td>
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<tr>
<td>Peasant association</td>
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<td>Assosa 01</td>
<td>54</td>
<td>21</td>
<td>38.88%</td>
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<tr>
<td>Assosa 03</td>
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<td>8</td>
<td>32%</td>
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<td></td>
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<tr>
<td>Amba 4</td>
<td>34</td>
<td>8</td>
<td>23.52%</td>
<td>3.932</td>
<td>0.415</td>
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<td>Amba 5</td>
<td>17</td>
<td>3</td>
<td>17.64%</td>
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<tr>
<td>Amba 8</td>
<td>70</td>
<td>21</td>
<td>30%</td>
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5. Discussion

In the current study, an overall prevalence of donkey strongyle infection in the study area was found to be of 30.5%. The overall prevalence of current study is in agreement with the works of Samuel and Berihun (2012) who reported the overall prevalence of strongyle infection in donkeys was 32.6% in and around Wollo Combolcha. The current result is higher than the result of Disassa et al (2013) who reported, 5.82% in donkeys in and around Dangila town. This low prevalence in and around dangile town may be due to the fact that the deworming program by Bahirdar donkey sunchery at the beginning and end of rainy season in the study area (Disassa et al., 2013). However the result of the current study was lower than the report of Mangassa and Tafese (2016) who reported 44.55 % in donkeys around Batu town, the reports of Getachew et al (2010) from east shoa and Adaa, Akaki and Bost of East shoa that revealed 100% in donkeys and Hassan et al (2004) in Sudan reported as 99.15%. The current result also lower than the report of Feseha et al (1999) and Tola et al (2013) in and around Gondar with a prevalence of 100% in donkeys. Additionally prevalence of donkey strongyle also reported as 87.81%, 76% and 70.8% by Tesfu et al (2014) in and around Hawassa town, Alemayehu and Etferahu (2013) in south wollo zone, which are higher than the current result.

Age was considered as a risk factor and higher prevalence observed in old animals (46.15%) while 41.07% and 19.04% prevalence observed in young and adult age groups, respectively. This result disagrees with works of sultan et al (2013) who reported 25.7%, 61% and 13.2% in young, adult, and old, respectively. The prevalence difference among the different age groups was statistically significant in the current study (P<0.05). The prevalence of Strongyle parasite was higher in old and younger ages. Higher infection rates and more severe infections indicate a low immunity in older and younger population (Soulsby, 1992).

Body condition scores was found to be a major risk factor (P<0.05) in the prevalence of strongyle parasite infection. The prevalence according to body condition was 83.72%, 19.6%, and 9.09% in poor, medium and good body condition scores, respectively. This prevalence lower than the findings of Tesfu et al (2014) that was reported 71.6%, and 70.7% in medium and good body condition scores, respectively. Body condition score was significantly associated with the prevalence of the strongyle parasite. This significant association might indicate that strongyle parasite is one of the factors for poor body condition score of the donkeys. On top of this, the difference might indicate that the poor body condition animals are at high chance of acquiring the parasite as compared to the medium and good body condition animals because of the poor immunity due loss of body weight.

Different prevalence of strongyle parasite were found among the animals from different selected peasant association for study namely Assosa 01, (38.88%), Assosa 03(32%), Amba 4(23.52%), Amba 5(17.64%) and Amba 8 (30%). Within the five peasant association there is no statistical significance association (P>0.05).

6. Conclusion and Recommendations

In present study moderate prevalence of equine (donkey) Strongylosis was obtained when compared...
with prevalence reported by different researchers at different areas. Based on the results of the present study, the prevalence of equine strongyle was highest in young and old animals than the adult ones. In addition to this, higher infection rate was recorded in donkeys with poor body conditions than in medium and good body animals it might be due to reduced immunity of old animal and inadequate development of the immune system in young animals. Moreover, as compared to other literature reports, body condition and age of the animals were found to be the important risk factors associated with equine Strongylosis infection whereas, sex and origin of the animals had no association with equine Strongylosis infestation in the current study animals. Owing to the huge donkey population in the study area, considerable contamination to the communal pasture grazing system could be the other factor which favors the survival of the parasite. Therefore, the following recommendations were forwarded.

- To get clear epidemiological picture of parasitic helminthes, comprehensive study should be launched in the area.
- Donkeys also require good management and awareness should be created regarding effective regular deworming.
- To control the burden of parasites, regular and strategic deworming programs with efficacious anthelmintics should be carried out regularly.
- Improved housing and feeding management system should be implemented to decrease the incidence of parasites in donkeys.
- The government should formulate and implement policies regarding management and health aspect of equines.
- All newly introduced equines into the herd must be quarantined and properly screened and treated to prevent environmental contamination with helminth parasites.

References


