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Epidemiological study of gastrointestinal helminths of donkeys in and around Bidar, Karnataka

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Abstract

The study was carried out to determine the prevalence of gastrointestinal helminthic infestations in donkeys in and around Bidar. In the current study 432 donkeys were put to investigate and collected fresh faecal sample from each animal in a zip tight covers, and samples were brought to the laboratory. Processing of faecal samples by standard faecal floatation and sedimentation techniques revealed an overall prevalence of helminth infestations determined at 65.74 percent based on faecal sample analysis. Strongyle spp prevalence was highest 51.76%, *Parascaris equorum* 14.08%, *Strongyloid spp.* 7.04%, *Gastrodiscus spp* 7.74%, *Oxyuris spp* infection 1.05%, and *Anaplocephala spp.* Infection 0.70%. The study showed a higher prevalence of helminth infestation in donkeys between the ages of 0 to 5 years (75.48%), as well as in female donkeys (66.52%) compared to male donkeys. The analysis revealed that the rainy season (73.52%) had a higher prevalence of helminth infestation.

Keywords: Epidemiology, helminth infestation, prevalence, donkeys, Bidar

Introduction

For thousands of years, the donkey has served as a beast of burden; frequently, it is a victim of savage slavery, being overburdened, under-nourished, and mistreated. Nonetheless, the donkey must rank among the most undervalued yet, significant draught animals in the world, playing a crucial role in the Third World's agricultural economy. According to estimates, animals provide 50% of the energy needed for agricultural productivity worldwide, and donkeys play a significant role in meeting this demand. The earliest domesticated donkeys appeared in Mesopotamia and Egypt around 4000 B.C. Donkeys require little care. They can therefore function on meagre foraging with minimal rest. Because of this, they are regarded as the best pack animal and the beast of burden used for hauling huge cargo through the plains, hills, and deserts in China, India, Egypt, Sudan, and Somalia.

They are the most affordable and practical mode of transportation in tropical nations like India, serving the needs of washer men, potters, home builders, brick producers, and vanjara workers who still do earthwork today. There are around 40 million donkeys in underdeveloped nations, but their full economic potential is still untapped. According to the FAO's 2002 census, there are three lakh donkeys in India, making up 2.25 per cent of the total world population. There are 9000 donkeys in Karnataka and 1743 in Bidar. Hence, donkeys play a significant role in the overall economic growth of our nation, particularly in rural and hilly areas. Despite their crucial economic relevance, breeding programmes and health management have not been done in a way that will preserve and improve Indian donkey breeds. Even today, the owner and, regrettably, a lot of vets throughout the world have misconceptions about the stoic, diligent donkey. Due to their extreme poverty, donkey keepers have a narrow perspective on the health of their animals. Their ability to produce work, perform reproduction, and most of their longevity have all suffered as a result. Several bacterial viral illnesses and parasitic infestations, including glanders, strangles, ulcerative lymphangitis, tetanus, equine influenza, and herpes virus infection can affect donkeys. Babesiosis, trypanosomiasis, and gastrointestinal strongylosis are regarded as silent killers among parasitic disorders. The performance and draught ability of the donkey is hugely affected by parasitic illnesses, which are widespread and diverse. Lichtenfels (1975)^[19] asserts that equids are the hosts of helminths from 28 genera and 75 species of nematodes, 2 genera

and 5 species of trematodes, and 3 genera and 24 species of cestodes. The small strongyles, commonly known as the cyathostomes (subfamily Cyathostominae within the Nematoda), make up a significant portion of the population of internal parasites in this complex group of helminths (Lichtenfels, 1975; Ogbourne, 1978; Herd, 1990) ^[9, 28]. The primary issue noted in donkeys admitted to the veterinary facility was helminth parasite infection (Ali *et al.*, 2001) ^[2]. According to Seri *et al.* (2004) ^[33], 70.1% of donkeys in Khartoum state had nematode infections.

The potentially deadly parasitic disease known as larval cyathostomosis is marked by severe diarrhoea, rapid weight loss, ventral oedema, and the presence of larvae in faeces, (Love *et al.*, 1999; Kelly and Fogarty., 1993) ^[21, 15]. *Strongylus vulgaris* causes verminous arteritis, which results in lameness, colic, and death (White *et al.*, 1993) ^[45]. According to Wheat (1975) ^[44], the most frequent cause of colic is arterial lesions caused by *S. vulgaris*. The most typical symptom of a large strongyle infection is colic. Although the data is insufficient, it has been estimated that thromboembolism related to *S. vulgaris* infection causes 90% of colic cases (Austin, 1994) ^[4]. Equine strongyle worms contain around 60 different species that have been discovered so far. The pattern of larval composition has changed globally, indicating increased cyathostome populations and a decline in *S. vulgaris* and other large strongyles (Klei, 1992) ^[18]. The prevalence of strongyle infection varies depending on the host's age (Uhlinger, 1993 and Linde *et al.*, 1999) ^[42, 20], climate (Klei, 1992; Herd and Coles, 1995) ^[18], management techniques (Linde *et al.*, 1999) ^[20], the parasite's generation period, and the infectivity of the pasture (Kelly *et al.*, 1981) ^[14].

Materials and Methods

The donkeys are close grazer that mostly looks for ground-level grasses rather than the tops of the different bushes and trees that are present in the region. In the present study 432 donkeys irrespective of sex, age and breed were selected and based on clinical manifestations the faecal sample were collected and screened to know the prevalence of helminth infestation in donkeys. These donkeys were included from the nearby villages like Chintaki Raipally, Nagmarpally, Malgi, Gadgi, Mudhol, Yengunda and Karanji as well as donkeys belonging to individual holdings in and around Bidar.

Collection of faecal samples for Parasitological examination

A total of 432 faecal samples were collected. Freshly voided faecal samples were taken from donkeys in and around the bidar district. These faecal samples were collected in small polyethene bags or zip-lock polyethene bags, tagged with rubber bands, stored in a cold environment, and then brought to the laboratory for further analysis to determine the incidence of helminth infestation in donkeys. Examination of faecal samples by following methods - Direct method and indirect methods.

Direct Method of faecal examination

On a glass slide, taken a little quantity of faecal samples and added a few drops of distilled water and made an emulsion. Put a cover slip on top of the mixture, which shouldn't be opaque, and inspect it with a low-power objective

microscope. Search thoroughly over the whole smear for protozoan structures, worm larvae, or parasite eggs.

Indirect method of faecal examination

The faecal samples were screened using the slandered parasitological techniques (Soulsby 1982) ^[38] viz. Sedimentation technique, and Flootation technique, in Sedimentation method 1 to 2 gm of faecal pellets were emulsified in 10-15 ml of distilled water using a mortar and pestle. After being filtered through a sieve to remove all the large particles and debris, the emulsion was centrifuged at 2000 rpm for 3 minutes. A drop of sediment was put on a clean glass slide, combined with a few drops of distilled water and then covered with a cover slip after the supernatant fluid had been decanted. After that, the silt was inspected with low-power objective (10x) microscope lenses to detect the presence of helminth eggs.

In Flootation technique 1 to 2 grams of faeces thoroughly mixed with distilled water using a mortar and pestle. A vertical flotation tube with a flat bottom measuring 7.5 cm by 2.5 cm and a depth of one-third was filled with this mixture. After that, a saturated sodium chloride solution was added to the tube, being careful not to let the contents spill out. The tube was constantly covered with a cover slip so that it was in touch with the fluid. For all the eggs to float up, the tube was left to stand for 30 minutes. The cover slip was swiftly placed on a glass slide, which was then quickly viewed with a low-power objective (10x) for the presence of helminth eggs.

A quantitative faecal investigation (McMaster egg counting technique) was carried out to determine the level of strongyle infestation in the known weight of the faecal sample. The severity of the sickness was determined by counting the number of eggs per gram of donkey faeces. Modified Gordon and Whitlock technique - Two grams of faeces was weighed and taken in a mortar and pestle and then with the measuring cylinder, 60ml of the saturated salt solution was taken, mixed with the faecal sample and passed through the sieve to form a suspension in the beaker, and further using a pipette the above-formed faecal suspension was stirred and charged in both the chambers of McMaster's slide.

EPG = Total number of eggs counted in both chambers × 100

Statistical analysis: The data obtained in the research work undertaken were statistically analysed and compared as per the standard statistical procedure suggested by Sendecor and Cochran (1994) ^[36] and the significance of the mean difference was tested by ANOVA test.

Results

In the current study, helminth infestation was assessed in 432 donkeys of diverse sexes, and ages. Moreover, donkeys with helminth infestations were observed to have clinical symptoms. A total of 18 strongyle-positive animals were selected for drug trials. Six donkeys were selected as controls for further haematological and biochemical analysis. These donkeys looked to be healthy and had no evidence of parasite infestations.

Prevalence

A total of 432 donkey faecal samples were analysed for helminth infestation. Out of them, 284 (65.74%) were found

for parasite positive, with prevalence data shown in table-1, depicted in figure-1. Out of 284 positive cases, 50 (17.60%) revealed a mixed infestation of helminths, whereas 234 (82.39%) indicated a single infection. Strongyle spp had the highest prevalence (51.76%), followed by *Parascaris equorum*, Strongyloids spp., *Gastrodiscus* spp., *Oxyuris equi* spp., and *Anoplocephala* spp with corresponding prevalences of 14.08%, 7.04%, 7.74%, 1.05%, and 0.70%. Shown in table-2, depicted in figure-2.

Age wise prevalence of Helminth infestation

The age-specific prevalence of helminth infestation in donkeys given in table-3, depicted in figure-3. According to the study's findings, donkeys aged 0 to 5 years had the higher age-specific prevalence of helminth infestation (75.48%), followed by those aged 6 to 10 years (66.67%), while donkeys older than 10 years (53.08%) had the lowest prevalence.

Sex-wise prevalence

The Sex-wise prevalence of helminth infestation in donkeys is shown in table-4, depicted in figure-4, study reveals that females (66.52%) had a higher prevalence than males (64.73%).

Season-wise prevalence

The seasonal incidence of helminth infestation in donkeys is listed in table-5, depicted in figure-5. The current study findings showed that the prevalence of helminth infestation was lowest in donkeys during the winter season (52.50%) and that it was highest in the rainy season (73.52%), followed by the summer season (67.60%).

Prevalence of Helminth infection in donkeys by direct method and indirect method

The observations on the diagnosis of faecal examination by the direct method are presented in table-7. Out of 432 faecal samples, 260 (60.18%) were found to be helminth-infested by the direct method of faecal examination and 284 (65.74%) samples were found to be helminth-infested by the indirect method of faecal examination samples.

Discussion

Prevalence

Donkey faeces from 432 different animals were analysed for helminth infestation. 284 (65.74%) of these individuals tested positive for helminth infestation. In the present study, the overall prevalence of helminth infestation in donkeys is (65.74%), the finding of the present study is almost similar to the findings of Tudor (2010) [41] (68.48%), Molla *et al.* (2015) (64.61%), and Alshaibani *et al.* (2019) [3] (67.75%). However overall prevalence was differ from that reported by Khan *et al.* (2010) [17] (31.0%), Imam *et al.* (2008) [13] (37.48%) and Bhavanakumar and Satichidanadam (1987) (22.0%), Seri *et al.* (2004) [33] and Ayele *et al.* (2006) [5]. In the present study, the mixed helminthic infestation was recorded in 50 (17.60%) cases of donkeys. The present finding of mixed helminthic infestation prevalence is in agreement with the finding of Shadia *et al.* (2018) [34] (24.2%), Khajuria *et al.* (2004) [16] (20.84%), and Ibrahim *et al.* (2011) [12] (35.40%). However, the present finding of mixed helminthic infestation prevalence of this study differed from others Taye (2017) [40] (10.4%), Mahfooz *et al.*

(2008) [22] (5.00%), and Waqas *et al.* (2014) [43] (5.0%) in comparison to previous studies, the current analysis found a higher incidence of helminth infestation in the study area might be associated with the lack of any parasitic helminthes intervention programme and the management systems in the area, where many donkeys were allowed to graze together on small plots of land throughout the year, which facilitates contamination between animals. (Parsani, 2008) [30]. There were Strongyles eggs in 147 (51.76%) of the positive faecal samples in the present study. These findings were in agreement with Parsani *et al.* (2013) [30], Mahfooz *et al.* (2008) [22] and Negash *et al.* (2021) who reported the strongyle positive in donkeys at 55.3%, 50% and 53% respectively. Contrary to these findings were reported by Esmaeel (2010) [8] (70.0%), Chitra *et al.* (2011) [2] (76.12%), Mezgebu *et al.* (2013) [27] (66.67%), and Takele and Nibret (2013) [39] (65.09%), the prevalence of Strongyle was higher. In contrast to earlier research, the current study had a low prevalence of Strongyles spp. (51.76%). The reason for the low prevalence is thought to be related to the adverse environmental conditions for the survival of the extrinsic stages of the parasite, the inability of strongyles to undergo inhibition inside the host, and long generation intervals.

Age wise prevalence

According to an analysis of the clinical study's data, donkeys aged 0 to 5 years had the highest frequency of helminth infestation (75.48%), followed by those aged 6 to 10 years (66.67%), while donkeys older than 10 years had the lowest incidence (53.08%). The findings of this study concur with those of the articles by Ajabe *et al.* (2020), Mathewos *et al.* (2021) [23], and Nagar *et al.* (2022) [25]. The delayed development of substantial immunity, which is initially low but rises with the intensity and duration of infection exposure, has been blamed for the high incidence of infection seen in the 0-5 year age range (Sabir and Bandyopadhyay 2016) [32]. Adults, however, have a reduced prevalence, which has been linked to the development of parasite immunity as a result of repeated exposure (Shah-Fischer and Say, 1989) [35].

Sex and season wise prevalence

According to the Sexwise prevalence survey, female donkeys were more likely than males to have helminth infestations. The results of this investigation were in agreement with those of Mathewos *et al.* (2021) [23], Nagar *et al.* (2022) [25], and Hamed *et al.* (2019) [9]. Due to their physiological characteristics, which frequently result in stress factors and lower their immunity to infections, female animals who are breastfeeding parents are weak and malnourished, making them more vulnerable to illnesses (Radostits *et al.*, 2007) [31]. Helminth infection was shown to occur more frequently in donkeys during the rainy season (73.52%), followed by the summer season (67.60%) and the winter season (52.5%). The results of this investigation were consistent with those of Nagar *et al.* (2022) [25], which may be because nematode larvae are more readily available in pastures during the wet season (July-September). In addition to lowering host immunity, rain and high relative humidity during the rainy season favour ecdysis and larvae dispersal, increasing the likelihood of infection (Soulsby, 1966) [37].

Table 1: Overall prevalence of helminth infestation in donkeys

Total samples screened	Positive	Percentage
432	284	65.74%

Table 2: Specieswise prevalence of helminth infestation in donkeys

Sl.no	Types of Helminth	Positive (%)
1	Singleinfestation	234(82.39%)
2	<i>Strongylusspp</i>	147(51.76%)
3	<i>Parascarisequorum</i>	40(14.08%)
4	<i>Strongyloidspp</i>	20(7.04%)
5	<i>Gastrodiscusspp</i>	22(7.74%)
6	<i>Oxyurisequi</i>	3(1.05%)
7	<i>Anaplocephalaspp</i>	2(0.70%)
8	Mixedinfestation	50(17.60%)
Total		284

(Mixed infestations include *strongylus spp*, *oxyuris spp*, *Anaplocephala sp* and *parascaris spp*)

Table 3: Agewise prevalence of helminth infestation in donkeys

Sl.No.	Types of Helminth	0-5years (n=155)	6-10years (n=147)	>10years(n=130)	Total
1	Single infestation	101(65.16)	78(53.06)	55(41.67)	234(54.17)
2	<i>Strongylusspp</i>	72(46.45)	52(35.37)	23(17.69)	147(34.02)
3	<i>Parascarisspp</i>	15(9.67)	10(6.80)	15(11.53)	40(9.25)
4	<i>Strongyloidspp</i>	08(5.16)	06(4.08)	08(6.15)	22(5.09)
5	<i>Gastrodiscusspp</i>	06(3.87)	08(5.44)	06(4.61)	20(4.63)
6	<i>Oxyurisequi</i>	0	02(1.36)	01(0.76)	03(0.69)
7	<i>Anaplocephalaspp</i>	0	0	02(1.54)	02(0.46)
8	Mixedinfestation	16(10.32)	20(13.60)	14(10.76)	50(11.57)
Total		117(75.48)	98(66.67)	69(53.08)	284(65.74)

Figures in parentheses indicate percent.

(Mixed infestations include *strongylus spp*, *oxyuris spp*, *Anaplocephala spp* and *parascaris spp*.)

Table 4: Sexwise prevalence of helminth infestation in donkeys

Sl.No.	Types of Helminth	Female (n=242)	Male (n=190)
1	Single infestation	133(54.95)	101(53.16)
2	Mixed infestation	28(11.57)	22(11.57)
Total		161(66.52)	123(64.73)

Figures in Parenthesis indicate percent.

(Mixed infestations include *strongylus spp*, *oxyuris spp*, *Anaplocephala spp* and *parascaris spp*.)

Table 5: Season-wise prevalence of helminth infestation in donkeys

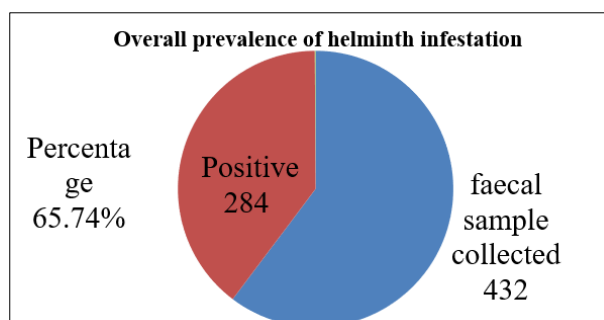
Sl.No.	Helminth	Summer (n=142)	Rainy (n=170)	Winter (n=120)
1	Single infestation	80(56.33)	103(60.58)	51(42.50)
2	Mixed infestation	16(11.26)	22(12.94)	12(10)
Total		96(67.60)	125(73.52)	63(52.5)

Figures in Parenthesis indicate percent.

(Mixed infestations include *strongylus spp*, *oxyuris spp*, *Anaplocephala spp* and *parascaris spp*.)

Table 7: Percentage of helminth infection in donkeys by different method

Methods(n=432)	Positive	Percentage
Direct method	260	60.18%
Indirect method	284	65.74%

**Fig 1:** Overall prevalence of helminth infestation in donkeys

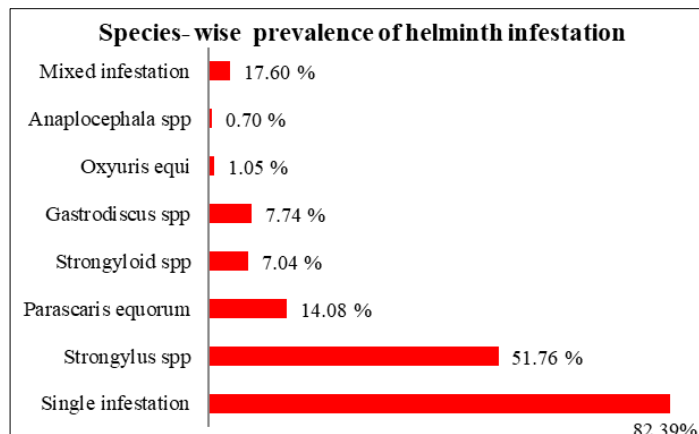


Fig 2: Species-wise prevalence of helminth infestation in donkeys

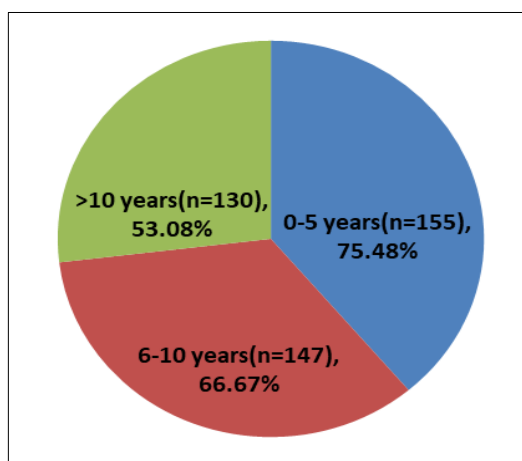


Fig 3: Age-wise prevalence of helminth infestation in donkeys

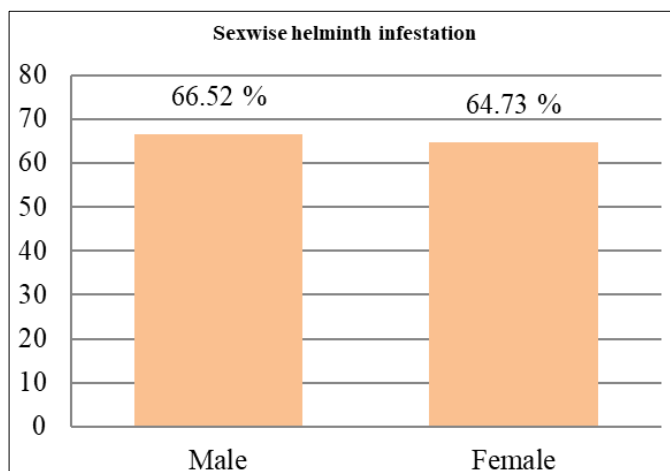


Fig 4: Sex-wise prevalence of helminth infestation in donkeys

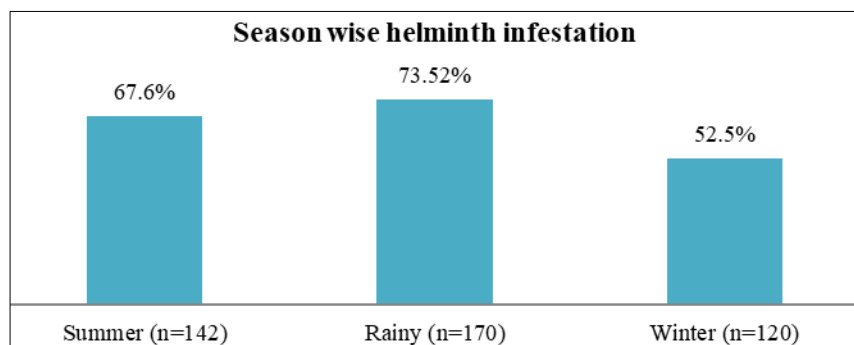


Fig 5: Season-wise prevalence of helminth infestation in donkeys

Conclusion

In and around Bidar, 65.74 per cent of donkeys had overall helminth infestations. *Strongylus* spp were more common among the helminth infection (51.76%) than *Parascaris equorum* spp (14.08%). *Strongyloid* spp prevalence was (7.04%), whereas *Gastrodiscus* spp prevalence was (7.74%). *Oxyuris equi* spp was (1.05%) and *Anaplocephala* spp was (0.70%) prevalent.

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