Assessment of risk factors associated with prevalence of strongyle infection in equines from Central Plain Zone, Punjab

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Abstract A total of 311 equine faecal samples (190 horses and 121 mules) collected from six districts of Central Plain Zone, Punjab were examined using standard coprological methods. The results showed an overall prevalence of 27.33 % for strongyles with rare to mild type of infection as evident from egg per gram of faeces. In particular, amongst the examined samples, 17.90 % of horses and 42.14 % of mules were infected and the difference was statistically significant ($P < 0.01$). Identification of the faecal culture harvested larval stages, showed 56 % and 46 % of horses and mules, respectively, positive for small strongyles (*Cyathostomes*). Amongst the large strongyles, highest proportion was recorded for *Strongylus vulgaris* whereas, *S. equinus* was found in least proportion. Results indicated that the various risk factors viz. area, season, age and sex of the host had no significant effect on prevalence of strongyle infection in equines.

Keywords Equines · Prevalence · Punjab · Strongyles · Risk factors

Introduction

Gastrointestinal (GI) parasitism is a common health problem in equine populations globally. The infections can be clinical or sub-clinical in nature; however, even light infections can hamper the development and performance of equines. Clinical symptoms include impaired performance, anaemia, unthriftiness, diarrhoea, weight loss, poor growth, colic, unpredicted sudden death along with predisposition to other disease causing pathogens. These parasites can cause varying degrees of damage, depending on their type and numbers along with the immune status of host (Soulsby 1982). Data on the prevalence on GI parasites in equine populations is of utmost importance, as it forms a baseline about the parasitic genera/species prevalent in the area which in turn helps in designing strategies for their effective control. In this regard, several studies have been conducted worldwide (Postoli et al. 2010; Anazi and Alyousif 2011). In Indian scenario, although adequate information is available on GI parasitism of equines (Sengupta and Yadav 1998; Sonone 2010; Pilonia et al. 2013) but from Punjab state till date there appears to be only one published report (Kaur and Kaur 2008). Hence the present study was planned to assess the status of GI parasites in equines in Central Plain Zone of Punjab state with special emphasis on strongyle infection and its association with various risk factors.

Materials and methods

Location and geography of study area

The Central Plain Zone constitutes a little more than 50 % of the total area of Punjab state. The zone covers an area of 18,000 km² and comprise of 8 districts viz: Ludhiana,

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Table 1 Prevalence of strongyle infections in equines of Central Plain Zone, Punjab

Risk factor	Horses			Mules		
	Examined	Positive	% Prevalence	Examined	Positive	% Prevalence
Season						
Winter	45	05	11.11	28	10	35.71
Summer	52	08	15.38	42	17	40.47
Monsoon	93	21	22.58	51	24	47.05
χ^2 value	–	–	3.022 ^a	–	–	1.028 ^a
Sex						
Male	87	14	16.09	41	18	43.90
Female	103	20	19.42	80	33	41.00
χ^2 value	–	–	0.355 ^a	–	–	0.078 ^a
Age						
1–4 years	41	09	21.95	34	12	35.29
5–8 years	64	11	17.19	41	17	41.46
≥8 years	85	14	16.47	46	22	47.82
χ^2 value	–	–	0.598 ^a	–	–	1.271 ^a
Districts						
Ludhiana	60	13	21.66	29	13	44.83
Amritsar	26	04	15.38	15	07	46.67
Patiala	38	05	13.15	29	14	48.28
Fatehgarh Sahib	14	03	21.42	20	07	35.00
Jalandhar	34	04	11.76	28	10	35.71
Tarn-Taran	18	05	27.78	–	–	–
χ^2 value	–	–	3.458 ^a	–	–	1.552 ^a
Total	190	34	17.89	121	51	42.15

^a Non significant

Amritsar, Jalandhar, Tarn Taran, Patiala, Fatehgarh Sahib, Kapurthala and Sangrur. The climate of the region is subtropical, rainfall in the region varies from 500 to 800 mm annually and about 80 % is received in a short period of 3 months (mid June to mid September). The average maximum and minimum temperatures are 41–42 and 4–7 °C, respectively. These climatic conditions provide favourable and conducive environment for the optimal development and propagation of various parasitic species.

Collection of samples

A total of 311 faecal samples were collected from equines [horses (n = 190) and mules (n = 121)] of various districts [Ludhiana (n = 89), Amritsar (n = 41), Jalandhar (n = 62), Tarn-Taran (n = 18), Patiala (n = 67) and Fatehgarh Sahib (n = 34)] of Central Plain Zone from organized as well as un-organized farms for a period of 1 year (2013–2014). Fresh faecal samples were collected per rectally using disposable polythene gloves and were individually kept in plastic bags. These bags were labelled

and brought to the Postgraduate Laboratory, Department of Veterinary Parasitology, College of Veterinary Sciences, GADVASU, Ludhiana by maintaining temperature of 4 °C with ice for further processing.

Coprological examination

The collected faecal samples were thoroughly examined macroscopically for colour, consistency, blood, mucus, parasites and/or segments, if any. The samples were then examined microscopically by standard qualitative techniques viz. sedimentation and floatation method for detection of parasitic eggs/oocysts (Soulsby 1982). The positive faecal samples were examined quantitatively using McMaster's egg counting method, to determine the parasitic load i.e. eggs per gram (EPG) of faeces and the intensity was categorized as per Reinemeyer (2009). Coproculture examination was also performed on representative number of faecal samples positive for strongyles as per standard protocol. The hatched out larvae were harvested and identified under light microscope as per standard keys of MAFF (1986).

Fig. 1 L₃ of *Cyathostomes* (**a** head region and intestinal cells; **b** tail region)

Statistical analysis

All data analyses were performed by using statistical software program (SPSS for Windows, Version 19.0, USA). Association between the prevalence of strongyle infection and various factors was carried out by Chi square (χ^2 -test).

Results and discussion

The overall prevalence of GI helminths was found to be 27.33 % (85/311), of which the respective prevalence for horses and mules was 17.90 % (34/190) and 42.14 % (51/121) and the difference was statistically significant ($P < 0.01$). Interestingly, no other GI parasites apart from the strongyle nematodes were recorded in the present study. Though the exact reason for this finding is not known, however, strongyle nematodes are the most important internal GI parasites of equines and the infection is a widespread and serious cause of poor health throughout the world (Postoli et al. 2010). The quantitative faecal sample examination revealed rare to mild type of strongyle infection with EPG ranging from 50 to 500 with an average of 85.71 ± 21.07 in horses and 100–600 with an average of 232.35 ± 31.14 in mules. The overall prevalence of GI helminths recorded in the present study was in close proximity with the observations of Sonone (2010), who

Fig. 2 L₃ of *Strongylus vulgaris* (**a** head region; **b** tail region)

reported 21.38 % prevalence from horses in Nagpur (India). Further, higher prevalence rates of GI helminths in equines have been reported by various workers from different parts of the country ranging from 57.81 to 95.09 % (Sengupta and Yadav 1998; Katoch et al. 2006; Pandit et al. 2008). As far as Punjab state is concerned, there is only one published study regarding the prevalence of GI parasites in horses as 76.47 % from Patiala and its adjoining areas (Kaur and Kaur 2008).

Mules showed much higher prevalence rate (42.14 %) for GI helminths than the horses (17.90 %) which is in accordance with Postoli et al. (2010). The lower prevalence in horses seems to be attributable to a reduced possibility for grazing and thus contact with the infective stages of parasites or intermediate hosts. Further, as the horses are valuable, maintained under appropriate hygienic conditions and receive periodical veterinary care, this might also play a significant role in reduced parasitism as compared with mules. Moreover, the observation of elevated prevalence for GI worms in the mules was an expected result, because of their low economic value and the poor conditions of housing and management and lack of deworming practices.

As far as seasonal variation is concerned, the prevalence was highest in monsoon followed by summer and least winters for both horses and mules but was statistically non-significant (Table 1). This could be attributed to the presence of optimal environmental temperature and high relative humidity in the monsoon season conducive for the development of free living pre-parasitic stages (Sengupta and Yadav 1998). However, as the cold and dry conditions are comparatively unfavourable for the development of

Fig. 3 L₃ of *Strongylus edentatus* (a head region and intestinal cells; b tail region)

parasitic stages leading to lower infection rates in these seasons. Similar variations in seasonal prevalence had been earlier reported by several workers (Sengupta and Yadav 1998; Singh et al. 2012; Matto et al. 2013).

Regarding sex-wise prevalence, females showed comparatively higher prevalence rates as compared to males for horses while for mules the trend was reverse but the variation was statistically non-significant (Table 1). Similar findings have also been reported by Singh et al. (2012) who found higher prevalence in female equines (75.73 %) as compared to males (72.30 %). Horses from Tarn-Taran district recorded the highest prevalence rates while for mules Patiala had maximum per cent prevalence for strongyles (Table 1). However, the difference among the districts was statistically non-significant.

Regarding age-wise prevalence of GI parasites, the highest prevalence rate was observed in horses of 1–4 years of age which may be due to the lower levels of immunity in this age group whereas, lowest prevalence was reported in animals of ≥ 8 years age group which may be due to the extreme care provided to this age group due to its maximum value in different related fields. Higher infection rate and more severe infection in young population have been shown due to lack of immunity (Urquhart et al. 1996). However, for mules the trend was exactly opposite to the horses and the difference was statistically non-significant (Table 1). In the past,

Fig. 4 L₃ of *Strongylus equinus* (a head region; b tail region)

Table 2 Percent distribution of various strongyle larvae in equines

Strongyle type	Species	Horses (%)	Mules (%)
Large strongyles	<i>Strongylus vulgaris</i>	23	29
	<i>Strongylus edentatus</i>	12	17
	<i>Strongylus equinus</i>	09	08
Small strongyles	Cyathostomes	56	46

strongyle infections had been reported to be more common in young animals as compared to mature animals (Bucknell et al. 1995).

Amongst the strongyles, irrespective of the species of equines, highest proportion was of larvae (third stage) of small strongyles (Cyathostomes) (Fig. 1a, b), whereas, in case of large strongyles, *Strongylus vulgaris* (Fig. 2a, b), *S. edentatus* (Fig. 3a, b) and *S. equinus* (Fig. 4a, b) were found in the decreasing order (Table 2). Reports of high infection rates of cyathostomes amongst the strongyle infection, irrespective of the species of equines are in line with Banerjee et al. (2002). The use of broad spectrum anthelmintics like benzimidazoles and macrocyclic lactones have resulted in drastic reduction in worm populations particularly large strongyles leading to higher infections of small strongyles in horse population (Konigova et al. 2002).

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Conflict of interest We declare that we have no conflict of interest.

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