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ROLE OF INTRINSIC AND EXTRINSIC EPIDEMIOLOGICAL FACTORS ON STRONGYLOSIS IN HORSES

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ABSTRACT

A total of 133 (65.51%) faecal samples were found positive for various helminths and most frequently strongyle infections were diagnosed with an infection rate of 58.5% (117/200) in a year long study to asses various epidemiological factors influencing the gastro-intestinal nematodes of horses. Significant difference in the prevalence of various gastrointestinal helminths was detected in the study population ($p \leq 0.05$). Species identified included: *Parascaris equorum* (*P. equorum*), *Dictyocalus arnifieldi* (*D. arnifieldi*), *Anoplocephla* species, *Gastrodiscus aegypticus* (G. *aegypticus*), *Strongyloides westeri* (*S. westeri*), *Trichstrongylus axei* (*T. axei*), *Strongylus vulgaris* (S. vulgaris), *Strongylus edentatus* (*S. edentatus*), *Strongylus equinus* (*S. equinus*) and *Trichonema spp*. Prevalence of strongylosis was not affected by age ($p = 0.1$). Higher eggs per gram of faeces (epg) were recorded in young horse (≤ 3 year old horses) as compared with older horses ($p \leq 0.001$). Similarly no difference in the prevalence of strongyle infections as influenced by sex could be detected ($p = 0.7$) and excretion of eggs was also not affected by the sex of the animals ($p = 0.06$). Season has no impact on the prevalence of strongyle infections ($p = 0.07$) but shedding intensity of strongyle eggs is affected by season ($p \leq 0.001$) and significantly higher egg excretion was recorded in spring and summer.

Key words: Horses, epidemiology, helminths, strongylosis, epg

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INTRODUCTION

Parasitism is the single most important impediment in successful horse rearing all over the world and many species of parasites are found to infect horses. Large and small strongyles are the significant pathogens of horses and in addition to that ascarids, thread worms, hair worms, pin worms and tapeworms are also found naturally in horses (Urquhart *et al*., 1996). Studies on prevalence of horse helminths in different parts of world have indicated varied prevalence under different management and parasite control systems (Chaudhry *et al*., 1991, Montinario *et al*., 2002, Champman *et al*., 2002, Boxell *et al*., 2004 and Capewell *et al*., 2005).

Strongylosis is the most common and economically devastating disease of horses. Clinically infected horses exhibit signs of unthriftiness, anaemia, colic and diarrhoea (Urquhart *et al*., 1996). Young horses may carry thousands of parasites and experience severe clinical symptoms with certain mortality if not treated (Herd, 1990). Mixed specie infections are most commonly found to infect the horses (Boxell *et al*., 2004). Studies in different parts of the world have demonstrated a shift in the prevalence of various species of equine parasites under treatment with different classes of anthelmintics (Kaplan *et al*., 2004 and Love, 2004). Intrinsic factors like age and sex are found to affect the strongyle infections and egg-excretion (Bucknell *et al*., 1995, Montenaro *et al*., 2002 and Francisco *et al*., 2009). A thorough understanding of the epidemiology of horse helminths under local management and climatic conditions will help in devising effective and economically viable parasite control programs. A year long study was designed to achieve the objectives: To determine the epidemiology of various gastrointestinal helminths of horses based on quantitative coprological examination; To record the effect of age, sex and season on the prevalence and strongyle egg shedding in natural infections.

MATERIALS AND METHODS

Two hundred faecal samples from horses of different age groups and either sex were collected over a one year period. Samples were collected directly from the rectum in a polythene bags or from the ground if identity of animal could be ascertained. Bags were tightly secured and were identified with a unique number with a permanent marker. Information about the age, sex and date of collection was recorded. Faecal samples were examined on the same day or stored in a refrigerator at 4^{o} C for processing next day.

The faecal samples were subjected to saturated sodium chloride floatation technique to isolate the eggs of various helminths and examined under microscope (Zajac and Conboy, 2006). Positive samples were examined by Modified McMaster egg counting technique to determine the shedding of eggs per gram of faeces (epg) by infected horses (Zajac and Conboy, 2006). Horses found positive for strongyle type eggs were subjected to Baermann technique (Zajac and Conboy, 2006) for faecal culture to obtain third stage larvae (L_3). These larvae were preserved in 10% formalin for identification (Anonymous, 1986). Larval identification was accomplished by studying their morphological characteristics (intestinal cells, body tail ratio and their size) by standard keys. Three age groups were 1 - 3 year, 4 – 10 years and 11 – 22 years. Seasonal affect was determined by dividing the year into four seasons of equal duration i.e. December – February (winter), March – May (spring), June to August (summer) and September – November (autumn). Data was collected and entered into personal computer (PC) for storage and analysis. Categorical data was subjected to Chi square or Z test to see the affect of age, sex and season. Effect of various epidemiological factors on shedding of eggs per gram of faeces was determined by one way analysis of variance (Wayne, 1995). Data analysis and statistical significance ($p \leq 0.05$) was accomplished by the SPSS, a computer based statistical program.

RESULTS AND DISCUSSION

An overall sixty six percent of sampled animals were found positive for various helminths (Table I) and statistical difference in the prevalence was observed ($p \leq 0.05$). Infections with multiple species were more frequently diagnosed as compared to single specie infections. Small number (11%) of animals was found excreting ascarid eggs and eggs of non strongylid helminths. Strongyle-type eggs were predominant and detected in 117 horses with a prevalence of 58.50%. Helminth infections are most common and a significant health concern due to morbidity and mortality. A greater proportion of sampled horses were found infected with various helminth parasites and results are consistent with the findings of other studies (Riaz, 1984, Francisco *et al*., 2009). Lower infection rates have been recorded in other studies where regular de-worming practices with effective drugs are routinely undertaken (Capewll *et al*., 2005). Low infection rates can also be attributed to a diagnostic technique of poor sensitivity (Chaudhry *et al*., 1991). Higher infection rates are reported in animals examined by post mortem examination (Boxell *et al*., 2004). Studies based on necropsy findings have better chance to diagnose many latent infections that are missed at coprological examination. In addition this technique can detect immature worms, migrating and encysted larvae along with mature worms (Chapman *et al*., 2002, Boxell *et al*., 2004).

Species of parasites identified in the study included *P. equorum* (5%), *D. arnifieldi* (2.5%), *Anoplocephla species* (1.5%), *G. aegypticus* (1.5%), *S. westeri* (1.5%), *T. axei* (23.07%). Species of large strongyle identified in sampled horses included; *S. vulgaris* (29.91%), *S. edentatus* (19.65%) and *S. equinus* (23.07%, Table II). Small strongyles of genus *Trichonema* (*Cyathostomum*) were identified in 47.86% of samples. Many studies have reported widespread occurrence of helminth species in horse population across the world and grown under varied management and climatic conditions (Chapman *et al*., 2002 and Boxell *et al*., 2004).

Distribution of certain species is inversely related to age of the study population and many species e.g. *P. equorum* and *S. westeri* are only found in foals as compared with mature animals (Urquhart *et al*., 1996, Love, 2003) due to development of immunity. Higher infections of strongylids in the current study correspond with the biology and epidemiology of these parasites as they require a longer period to complete the life cycle and slow / partial development of immunity. Studies over the years have indicated a significant change in worm population and their burden under different anthelmintic pressures over the years (Dunsmore and Jue Sue, 1985, Herd, 1990, Chapman *et al*., 2002).

Many intrinsic (sex, age, breed) and extrinsic factors (management, climate and parasite control program) influence the prevalence of parasites of domestic animals. Use of broad spectrum anthelmintics like benzimidazoles and macrocyclic lactones has resulted in drastic reduction in worm populations of large strongyles (Konigova *et al*., 2002, Love, 2003) and now small strongyles are more frequently encountered in horse populations (Boxell *et al*., 2004). Although round worms are quite effectively controlled by macrocyclic lactones but repots of drug resistance are available in equines as in other animals (Trawford *et al*., 2005).

Data on age related prevalence indicates no difference ($p = 0.10$) among various age groups (Table III). A higher proportion of young animals (≤ 10 years of age) were found positive for strongylosis as compared with older horses (≥ 11 years of age). Similarly no affect of age for the strongyle infections could be detected in other studies (Francisco *et al*., 2009). In one study, small strongyle infections were more common in young horses as compared with mature animals (Bucknell *et al*., 1995). Severity of infection as determined by epg has shown a significantly higher average egg excretion by young horses (≤ 3 year old horses) as compared with older horses in other parts of the world (Lind *et al*., 1999). Higher infection rates and more severe infections indicate a lack of immunity in younger population (Urquhart *et al*., 1996).

Analysis of data for sex related susceptibility to strongyle infections indicates a lack of any difference among the two groups ($p = 0.94$) and gender does not seem to play a role in this regard (Table IV). This phenomenon is also observed by other workers under different management and climatic conditions (Francisco *et al*., 2009). Eggs excretion is also not affected by the sex of the animal ($p = 0.06$). Stratification of sex related

Table I: Prevalence of Various Species of Helminthic Parasites of Horses based on Copro - Diagnosis

N= 200

Species of Parasites Identified on eggs	Number of Positive samples	Percent of samples found positive (% + ve)
Parascaris equorum	14.0	5.0
Dictyocaulus arnifeldi	3.0	1.5
Anoplocephala spp.	3.0	1.5
Strongyloides westeri	3.0	1.5
Strongylid type	117	58.5
$X^2 = 324.497$	$p \leq 0.001$	

Table II: Prevalence of Various Species of Strongylids Identified on Coproculture.

N=117

Species of Parasites Identified	Number of Positive samples	Percent of samples found positive (% + ve)
Strongylus vulgaris	35	29.91
Strongylus edentatus	23	19.65
Strongylus equines	14	11.96
Trichstrongylus axei	27	23.07
Trichonema Spp	56	47.86

Table III: Age related prevalence of prevalence of strongylosis in horses and egg excretion (EPG) by positive horses.

N=200

Age Groups	Number of Horses Examined	Number of Positive samples	Percent of Positive samples (%+ve)	Average EPG (Egg per gram)
≤ 3 Years	12	9	75	583
≤ 10 Years	105	73	70	352
≥11 Years	83	35	42	354
$X^2 = 4.55$		P = 0.10		P = 0.001

Table IV: Overall sex related of prevalence of strongyle infections in horses and egg excretion (EPG) by positive horses.

Sex of the sampled Animals	Number of Horses examined	Number of horses found positive	Percent Positive	Average EPG
Male	127	78	61	247
Female	63	39	62	166
		P = 0.94		P = 0.06

data into three age groups indicate a statistical difference in two groups and that may be attributed to age

Table V: Sex related of prevalence of strongyle infection in horses and egg excretion (EPG) by positive horses (after stratification of data).

N=200

Sex of the sampled Animals	Age in years	Number of samples Examined	No. of Positive Samples	Prevalence (%)	Average EPG
	≤ 3 Years	8	5	62.5	660
Male	≤ 10 Years	74	52	70	382
	≥11 Years	45	21	47	371
$X^2 = 6.58$			P = 0.03		P = 0.08
	≤3 Years	4	4	100	488
Female	≤10 Years	31	21	68	283
	≥11 Years	38	14	37	329
$X^2 = 10.24$			P = 0.04		P = 0.005

Table VI: Seasonal Prevalence of Strongyle infection in horses and egg excretion of strongyle eggs by Horse

Season	Number of samples Examined	Number of Positive Samples	Percent Positive (% +ve)	Average excretion of eggs (Av. Epg)
Summer	48	30	63	304
Autumn	52	25	48	112
Winter	48	25	52	95
Spring	52	37	71	368
Over all	200	117	58.5	
		P = 0.07		P = ≤ 0.001

(Table V). Stratification of age has not revealed difference in egg shedding in males but statistical difference in three groups of females was apparent. In this case there were small number of animals in certain groups and may have contributed to this difference.

Season of the sampling does not have any effect on the prevalence of strongyle infections (Table VI) and infections are frequently diagnosed throughout the sampling period (p = 0.07). This is also reported by Montinaro *et al*., 2002 and study could not find any difference in the egg excretion. Relatively higher infection rates and significantly higher egg shedding ($p \leq 0.001$) were observed in the present study during spring and summer and findings were consistent with the results of other study (Herd, 1990). Observation of data on month wise prevalence indicates that strongyle infections and their intensity was highest in month of May as compared with other months.

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