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Original Research

Seasonal effects on the gastrointestinal parasites in horses at Port Harcourt Polo, Rivers State, Nigeria

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ABSTRACT

The current study examined various gastrointestinal (GI) parasite species to which the horses at Polo Club, Port Harcourt were exposed during the rainy and dry seasons. Between September 2023 and February 2024, a total of 80 Polo horses were evaluated. During each season, forty horses of various sexes and breeds were examined. The animals were classified as young (<4 years), adult (4 – 10 years), and old (>10 years). Feacal samples were collected from each horse and soil samples were also collected from three different spots within the Polo Club. Floatation technique was used to ascertain the faecal and soil eggs of the identified parasite species. The results were presented using descriptive statistics. Chi-square was used to analyze the data and $P \leq 0.05$ was considered to be significant. The result revealed a significantly ($P \leq 0.05$) higher GI parasite prevalence during the rainy season compared with those recorded during the dry season. Seasonal results showed that *Strongylus* and *Strongyloides* species were highly prevalent. The results indicated that the horses had four (4) helminths parasites during the rainy season: *Stronglyus* spp. (90%), *Strongyloides* spp. (97.5%), *Gastrodiscus* spp. (25%), *Trichonema* spp. (25%), and one (1) intestinal protozoan parasite, *Eimeria* spp. (2.5%). The findings during the dry season showed that there were *Strongylus* spp (82.5%), *Stongyloides* spp (70%), *Triodontophorus* spp (5%), and *Oxyuris* spp (2.5%). The outcome showed that there was no significant ($P > 0.05$) association between sex of the horses and prevalence of GI parasites while there was significant association between season, age, breed and prevalence across different season. In conclusion, these parasites are more common during the rainy season therefore efforts should be focused on effective management practices, early identification, and treatment with anthelminthic and anti-protozoan medications during this period.

Keywords: Floatation technique, gastrointestinal parasites, Port Harcourt, season, soil

INTRODUCTION

Horses are companion animals with significant economic implications globally (Nelly *et al.*, 2020). Horses have been utilized for a number of extremely labor-intensive tasks. Equines have a prominent position in the agricultural systems of many developing countries. Horses are used to pull plows, harrows, and other farming equipment thereby, helping to prepare the soil for planting. Their strength enables farmers to cultivate larger areas more efficiently than using manual labor. In Nigeria, horses have been used in sugarcane crushing and processing (Kalkat & Kaul, 1983). They can be used for entertainment, sports and also kept by the police and army for defense and security operations (Oladipo *et al.*, 2015). They are also utilized for riding, driving, flock protection, companion, breeding and training calves (Gebrewold & Yami, 2004), and provide urban dwellers with opportunity of income generation (FAO 1999). Horse health and performance are influenced globally by intestinal parasitism, which is one of the most significant problems facing horses in underdeveloped nations (Tolossa & Ashenafi, 2013). Horses are susceptible to gastrointestinal infestations when grazing which negatively impacts the animals' well-being, output, and ability to work (Nelly *et al.*, 2020). They are reported to be more susceptible to a large number of parasites and may harbor different species at any time which may damage the intestine depending on the nutritional status, age and natural defense of the individual equine (Wannans *et al.*, 2012; Alemayehu & Etaferahu, 2013). This is because, the gastrointestinal tract provides conducive environment for the existence and proliferation of many of these parasites (Umar *et al.*, 2013). Animals with intestinal parasites, including helminths, typically develop subtle illnesses. According to Stoltenow and Purdy (2003), an infected horse may exhibit symptoms such as weakness,

emaciation, restlessness, unthriftiness, diarrheoa, anemia and occasionally intestinal obstruction or perforation. This clinical signs can lead to poor body condition, decreased exercise, poor reproductive outcomes, and a shortened life span.

In several African nations, including Ethiopia, Kenya, Zimbabwe, Burkina Faso, and Morocco, a significant number of internal parasites have been reported in working horses(Izachew *et al.,* 2006). According to Johnson (2012), horses are known to be infected with about 150 different forms of internal parasites and the most frequently encountered are *Parascaris, Fashiola* species, *Strongyloides westeri, Oxyuris equi, Strongylus vulgaris, Strongylus edentatus* and *Cyathostomes* (Alemu *et al.,* 2011).

The purpose of this study was to ascertain the impact of the season on gastrointestinal parasite infestations and related risk factors in horses kept at Polo Club, Port Harcourt, Rivers State, Nigeria.

MATERIALS AND METHODS

STUDY AREA

This cross sectional study was carried out on horses owned by the Port Harcourt Rivers State-based Polo Club between September 2023 (the rainy season) and February 2024 (the dry season). Geographically, Rivers State is located at 4°45′N 6°50′E. The tropical monsoon climate of Port Harcourt features long, strong rainy seasons as well as short dry seasons (NOAA, 2016). The only months in the city that actually fall within the dry season are December through February. September is the wettest month in Port Harcourt, with an average of 367 millimeters, or 14.45 inches of precipitation. With little seasonal variation, the city's temperatures are mostly constant throughout the year. The city typically experiences average temperatures between 25 and 28 °C (77.0 and 82.4 °F). Relative humidity usually stays between 90% and 100% throughout the year, with very few instances when it drops below 60% (William, 2008).

STUDY ANIMALS

A total of eighty horses were sampled during the study. Forty horses were examined per season. These horses are used for recreational and competitive polo matches. They have access to hand-cut grass or open pastures for grazing, and they are housed in stables where they are fed concentrate and crop leftovers. The animals' ages were ascertained using information from the Polo Club records in addition to tooth eruption and wear. Three age groups were used to categorize the research animals: young (under four years old), adult (4–10 years old), and old (beyond ten years old). The horses were dewormed two months before the rainy season sampling and one month before the dry season sampling.

FAECAL COLLECTION AND EXAMINATION

Using transparent polythene hand glove, faecal sample was taken from each horse's rectum in accordance with standard protocols (Stoltenow &Purdy 2003). Also, feacal samples were collected from recently voided faeces. The collected feaces were knotted and appropriately labeled and stored in an ice box. The samples were transported to the Parasitology Laboratory of the College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, within 12 – 24 hours for analysis. The samples were then screened using the simple floatation and sedimentation method (MAFF, 2006) for helminthic eggs and other protozoan oocysts. Eggs were recognized using Soulsby's (1982) standard identification key and morphology. The presence of adult helminths was examined macroscopically in the fecal samples. The number of horses' diagnosed positive for a particular parasite divided by the total number of animals examined at that specific time was used to determine the prevalence of each parasite infection (Thrusfield, 2005).

SOIL SAMPLE COLLECTION AND EXAMINATION

Three areas of the Polo Club were used to gather soil samples: the walk paths, the dump sites, and the grazing area where the horses eat. Using a hand trowel, a sample of about 50 g of soil was taken at a depth of 2 to 5 cm. The soil sample was allowed to air dry before being sieved through a 250 μm fine sieve to allow helminths eggs to pass through. The parasites were extracted from the soil samples using the flotation process.

STATISTICAL ANALYSIS

Data collected were analysed using GraphPad Prism, version 10.2.3. The data generated was presented as descriptive statistics and Chi-square analysis was used to determine the association between the gastrointestinal parasites and variables such as season, sex, age and breed. Statistical significance was set at $P \leq 0.05$.

RESULTS

The results revealed a significant association ($X^2 = 20.15$, df= 2, $P \leq 0.0001$) between the observed parasites during the rainy season compared with those recorded during the dry season (Table I). Age and breed, showed a significant association ($P \leq 0.05$) in the recorded parasites during the study periods (Table II and III). There was no significant association between the sexes of the horses sampled during the two seasons (Table IV). Out of the horses sampled during each season, 97.5% and 70% of the horses were affected respectively during the rainy and dry season with one or more of the intestinal parasite species. Thus, there was a significant association ($P \leq 0.05$) between the horses affected by mixed infection during the rainy compared with those affected during dry season. The result during the dry season revealed high prevalence of *Strongylus* spp (82.5%) and

Strongyloides spp (70%) and low prevalence of *Triodontophorus* spp. (5%) and *Oxyurus* spp. (2.5%). Similarly, during rainy season, the prevalence of *Strongylus* spp (90%) and *Strongyloides* spp (97.5%) was high. There was low prevalence of *Eimeria* spp (2.5%), *Gastrodiscus* spp (25%) and *Trichonema* spp (12.5%) at this season. During the dry season, 37.5% of the indigenous breeds, 35% of the Sudanese and 25% of Argentine breeds were affected by the parasites. Based on the sex, 57.5% of the males and 40% the females were affected. 10%, 67.5% and 22.5% of the young, adult and old horses were affected respectively by the parasites. During rainy season 47.5% of indigenous, 20% of the Sudanese and 27.5% of the Argentine horses sampled were affected. Regarding sex, more females (52.5%) were affected than males (42.5%). 7.5% of the young, 47.5% of the adult and 40% of the old horses sampled were positive for gastrointestinal parasites during the rainy season. *Strongylus* spp, *Strongyloides* spp, *Trichonema* spp, *Triodontophorus* spp and *oxyurus* spp were identified from sand at various collection sites.

DISCUSSION

The study's findings revealed the high prevalence of some helminths and the subpar veterinary care provided to the horses. The current study's findings on the prevalence of parasite infestation in horses are consistent with those of Mbafor *et al.* (2012) and Mathewos *et al.* (2022) though higher than those of Tesfu *et al*. (2014), who reported a prevalence of 63.7%. The use of anthelminthic treatments, grazing practices, and inadequate management systems could all be contributing factors. It is also possible to attribute the greater incidence of helminthic infestation in this study to grazing on contaminated areas as evidenced by the positive samples got from the soil.

The result revealed a higher prevalence during rainy season when compared with dry season. Nigeria's wet season is characterized by high humidity and generally mild temperatures, which are favorable for the development of parasites, and the increased likelihood of infectious larvae

Table I: The number (%) of the observed GIT parasites during dry and rainy seasons in Port Harcourt Polo

Season	**No. of horses Examined**	***Strongylus* Spp**	***Strongyloides* Spp**	***Eimeria* Spp**	***Trichonema* Spp**	***Gastrodiscus* Spp**	***Triodontophorus* Spp**	***Triodontophorus* Spp**
Dry	40	33(41.25)	28 (35.00)	0	0	0	2 (2.50)	1(1.25)
Rainy	40	36 (45.00)	39 (48.75)	1 (1.25)	10 (12.50)	10 (12.50)	0	0
Overall	80	69 (86.25)	67(83.75)	1 (1.25)	10 (12.50)	10 (12.50)	2 (2.50)	1(1.25)

$Chi^2 = 20.5$, $P \leq 0.05$

Table II: Seasonal Prevalence of GIT Parasites Based on Breeds of Horses in Port Harcourt Polo

Season	**Breed**	**No. of horses Examined**	***Strongylus* Spp**	***Strongyloides* Spp**	***Eimeria* Spp**	***Trichonema* Spp**	***Gastrodiscus* Spp**	***Triodontophorus* Spp**	***Oxyurus* Spp**
Dry	Argentine	11	11(13.75)	2 (2.5)	0	0	0	0	0
	Sudanese	13	10(12.50)	11 (13.75)	0	0	0	1(1.25)	1(1.25)
	Indigenous	16	13(16.25)	13(16.25)	0	0	0	1(1.25)	0
Rainy	Argentine	12	10 (12.50)	12 (15.00)	0	3 (3.75)	2 (2.50)	0	0
	Sudanese	8	6 (7.50)	4 (5.00)	0	0	3(3.75)	0	0
	Indigenous	20	20 (25,00)	20 (25.00)	1 (1.25)	5 (6.25)	8(10.00)	0	0
	Overall	80	70 (87.50)	62(77.50)	1 (1.25)	8 (10.0)	13(16.25)	2 (2.5)	1(1.25)

$Chi^2 = 14.81$, $df = 4$, $P \leq 0.05$

Table III: Seasonal Prevalence of GIT Parasites Age on Age of Horses in Port Harcourt Polo

Season	***Age***	***No. of horses Examined***	***Strongylus Spp***	***Strongyloides Spp***	***Eimeria Spp***	***Trichonema Spp***	***Gastrodiscus Spp***	***Triodontophorus Spp***	***Oxyurus Spp***
Dry	*Young (> 4yrs)*	*4*	*3 (3.75)*	*4 (5.0)*	*0*	*0*	*0*	*0*	*0*
	Adult (4 -10yrs)	*27*	*24(30.00)*	*20 (25.0)*	*0*	*0*	*0*	*1(1.25)*	*1(1.25)*
	Old (< 10yrs)	*9*	*7 (8.75)*	*8 (10.00)*	*0*	*0*	*0*	*1(1.25)*	*1(1.25)*
Rainy	*Young (> 4yrs)*	*4*	*2 (2.50)*	*3 (3.75)*	*0*	*0*	*2 (2.50)*	*0*	*0*
	Adult (4 -10yrs)	*20*	*20 (25.00)*	*20 (25-00)*	*1(1.25)*	*4 (5.00)*	*3 (3.75)*	*0*	*0*
	Old (< 10yrs)	*16*	*16 (20.00)*	*16 (20-00)*	*1 (1.25)*	*4 (5.00)*	*3 (3.75)*	*0*	*0*
	Overall	*80*	*72(90)*	*71(88.75)*	*2 (2.5)*	*8 (10)*	*8(10)*	*2(2.5)*	*2(2.5)*

Strongylus spp. and *Strongyloides* spp were found to be more common than other

Table IV: Seasonal Prevalence of GIT Parasites Based on Sex of Horses in Port Harcourt Polo

Season	**Sex**	**No. of horses Examined**	***Strongylus* Spp**	***Strongyloides* Spp**	***Eimeria* Spp**	***Trichonema* Spp**	***Gastrodiscus* Spp**	***Triodontophorus* Spp**	***Oxyurus* Spp**
	Male	23	16 (20.0)	17(21.25)	0	0	0	3 (3.75)	0
Dry	Female	17	15(18.75)	11 (13.75)	0	0	0	0	1(1.25)
Rainy	Male	18	16(20.0)	18(22.50	1 (1.25)	6 (7.5)	5 (6.25)	0	0
	Female	22	21 (26.25)	21(26.25)	0	2 (2.5)	3 (3.75)	0	0
	Overall	80	68 (85.0	67 (83.75)	1(1.25)	8 (10)	8 (10)	3(3.75)	1(1.25)

Table V: Mixed Infection Based on Season

Mixed Infection	**Dry Season**	**Rainy Season**
Strongylus + Strongyloide Species	24	14
Strongylus + Strongyloide + Eimeria Species	0	1
Strongylus + Strongyloide + Gastrodiscus Species	0	17
Strongylus + Strongyloide + Triodontophorus Species	0	7
Strongylus + Triodontophorus Species	3	0
Strongylus + Strongyloide + Oxyuris Species	1	0
Overall	28	39

Table VI: Seasonal Distribution of Soil GIT Parasites Based on Collection Sites

Season	No. Sampled	Strongylus Spp	*Strongyloides* Spp	*Eimeria* Spp	*Trichonema* Spp	*Triodotophorus* Spp	*Oxyurus* Spp	Total Parasites
Dry Season								
Walk Path	2	2	1	0	0	0	0	3
Grazing Area	3	2	1	0	0	1	0	4
Dump Sites	2	1	1	0	0	0	1	3
Rainy Season								
Walk Path	3	1	2	0	1	0	0	4
Grazing Area	3	2	1	0	2	0	0	5
Dump Sites	3	1	1	0	1	0	0	3
Overall	16	9	7	0	4	1	1	22

spreading to grazing animals. Even with a regular treatment regimen, horses which are allowed to graze in open fields or on hand-cut grasses may still become infected. Conversely, Musa *et al.* 2016 found no significant relationship between rainy season and gastrointestinal parasites in horses.

primary obstacles parasites during the rainy and dry seasons. This was also observed by Devkota *et al.* (2021). *Strongylus* species and *Strongyloides* species were also identified by Ehizibolo *et al*. (2012) in horses owned by institutional, traditional, and private owners in several states in Northern Nigeria.

Strongyloides and *Strongylus* species have life cycle whereby adult parasites within the horse deposit eggs, which are then expelled into the pasture. Within the egg, the larva grows, hatches, and molts twice before reaching the infectious third stage (L3) larva. Despite the horses receiving routine veterinary care, the infective stage may contaminate pastures, exercise areas, housing facilities, and feeds, leading to auto-infection or re-infection of horses. This could be the cause of the observed prevalence. *Strongylus* Spp. prevalence in horses was also documented by Khan *et al*. (2017) and Wosu & Udobi (2014). This is explained by their direct life cycle, which eliminates the need for an intermediary host and facilitates an easier infection and quicker lifecycle completion (Ola-Fadunsin *et al.,* 2018). Strongyles, both large and small, are notorious for being voracious blood suckers, which can cause anemia in affected horses. Moreover, by shifting their places of attachment to the host, these parasites help to provide ideal conditions for bacterial colonization of areas that have been shed (Alan & Marchiondo, 2019).

It is also possible to link the high prevalence of these parasites to both inadequate hygiene and irregular deworming of horses. It also serves as a gauge for the extent of environmental contamination caused by GIP cysts and infectious larvae, which are typically the to successful parasite control (Umar *et al*., 2013).

According to Roberts & Janorvy (2005), young horses are typically infected during the parturition process and are linked to humid conditions and inadequate sanitation practices.

In the present study, older horses were more affected. Only horses older than four years old had *Eimeria* spp. This could be because older horses move less and spend more time in one area, feeding or grazing on their own waste products. The process of raising horses exposes them to a significant risk of parasite infection due to pasture re-infection.

During the rainy season, more female horses were affected compared to the male horses. Chinwe *et al*. (2019) noted this and hypothesized that female horses with weakened body immunity are typically more vulnerable to parasite infections than their male counterparts. Elmajdoub *et al*. (2022) found that 97% of male and 100% of female equestrian club horses were affected.

There was significant difference between the breeds of horses infected during the seasons. The indigenous breeds were more affected. This could be that the indigenous breeds are given less veterinary care compared to the Argentine and Sudanese breeds. The parasites *Strongylus* spp. and *Strongyloides* spp. primarily impacted the three horse breeds under investigation. The *Eimeria* Spp. was the least common parasite and it only affected one indigenous breed and did not affect the Argentine and Sudanese breeds. Its capacity to infect a native breed supported the findings of Ehizibolo *et*

al. (2012), who reported that the *Eimeria* spp is the principal protozoan affecting horses in Nigeria.

The presence of mixed parasite infection could be due to the exposure of the horses to different forms of feeding such as access to dump sites and infected fields which could habour some of the infective parasites.

Strongylus spp, *Strongyloides* spp and *Trichonema* spp were found in the soil samples collected from the walk path, field and dump sites . While *Strongyloides spp* were more common on the walk route, *Strongylus spp* were more in the field. *Strongylus species* have migratory life cycles that allow their larvae to spend a considerable amount of time in a variety of preference sites, according to Cullianane *et al*. (2006). The research and the findings of Eze *et al.* (2019) are comparable to this study where infective parasites were identified from soil samples.

CONCLUSION

The present study indicated a high prevalence *Strongyles* and *Strongyloides* species during the dry and rainy season. There was a statistically significant difference in gastrointestinal parasite infestation between the two seasons studied. The study showed that old horses and indigenous horses were most susceptible. Even with routine deworming and stable management, a variety of gastro intestinal parasites was still present in the horses, which may have an impact on their performance and general health. These parasites may be brought on by inadequate stable hygiene, re-infection from contaminated environments, and the use of inferior or ineffective veterinary medications, which are widely available in Nigerian markets.

RECOMMENDATION

To control GIP, it is advised to practice better stable hygiene, strategically deworm animals to lessen environmental contamination, and utilize veterinary medications from reputable, licensed veterinary pharmaceutical enterprises. Achieving 0% egg count would assist reduce environmental contamination. Frequent monitoring of fecal egg output would help identify affected horses for treatment.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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