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PREVALENCE OF GASTROINTESTINAL PARASITES OF HORSES AND ASSOCIATED RISK FACTORS IN PLATEAU STATE, NIGERIA.

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ABSTRACT

Horses are companion animals and highly resourceful in sports, national and traditional ceremonies, military and paramilitary involvements hence they play an important part in the economics of Nigeria. Gastrointestinal parasites are known to be deleterious to horses thus affecting the health, productivity and working capacity. In order to determine the prevalence of Gastrointestinal parasites and associated risk factors, fecal samples were collected from 107 horses comprising 58 females and 49 males from 3 local government areas including Jos North, Jos South and Riyom in Plateau State, samples were carefully examined using floatation and sedimentation techniques. The overall prevalence of gastrointestinal helminths was 46.7% out of which 11.2% were mixed infections. 7 different gastrointestinal parasites were observed in the animals studied: *Ascaris equorum* (12.1%), *Eimeria* spp (8.4%), *Fasciola* spp (3.7%), *Gastrodiscus aegyptiacus* (2.8%), *Strongyloides* spp (7.5%), *Strongylus* spp (11.2%) and *Trichomena* spp (14%). No significant differences ($p>0.05$) in the prevalence of gastrointestinal parasites were observed in relation to age, sex and breed but there was significant variation ($p<0.05$) in relation to location. The study reveals that gastrointestinal helminths are still a major constraint to the overall working and productivity of horses in the study areas hence the need for improved management practices

1.INTRODUCTION

The global equine population is estimated at 58 million, with Nigeria having about 240, 000 horses [1]. Plateau state is known for her rich entertainment culture and sporting activities where horses have a part to play especially in the area of adding economic value. Activities ranging from polo, interstate tournaments, rallies, movie production, coronation ceremonies, military and paramilitary involvements. The deleterious effects of helminth parasites on the equine hosts are well recognized globally and documented and in general, more than 150 types of internal parasites are known to infect horses [2]. An apparently healthy horse can harbour over half a million gastrointestinal parasites such as protozoa, trematodes, cestodes and nematodes. This is because the gastrointestinal tract provides a suitable environment for the survival and proliferation of many of these parasites [3]. Gastrointestinal parasites, in heavy infection may bring alteration in the normal haematological values among affected animals like neutrophilia, eosinophilia and anaemia [4]. The mature worms produce toxins that migrate to the red blood cells, which causes unthrifty anaemic condition while the immature worms migrate through the body tissues, open the way for bacteria and fungi complication [5]. Gastrointestinal parasites are common in both temperate and tropical countries, but more prevalent in warm countries where sanitation is poor and standard of living is low [6].

The effect of helminth infections is determined by a combination of factors, of which the varying susceptibility of the host species, the pathogenicity of the parasite species, the host/parasite interaction, and the infective dose are important [7,8]. The most important predisposing factors of helminth infections are grazing habits, climate, nutritional deficiency, pasture management, immunological status, vector, presence of intermediate host, and the number of infective larvae and eggs in the environment [5]. The aim of this study is to determine the prevalence and risk factors responsible for gastrointestinal parasite infection of horses in the study areas.

2. MATERIALS AND METHODS

2.1 The study Area

The study was conducted in Jos North, Jos South and Riyom local government areas of Plateau State. Riyom has a coordinate of 9°38'N 8°46'E. It has an area of 807km2. Jos South has a coordinate of 09º48'N 08º52'E and elevation of 1,200m (4.035ft) above sea level and an area of 510km2. Jos North has a coordinate of 09º55'N and 08º54'E with an average humidity of 60% and annual rainfall of 1400mm. It has an area of 291km^2 [9].

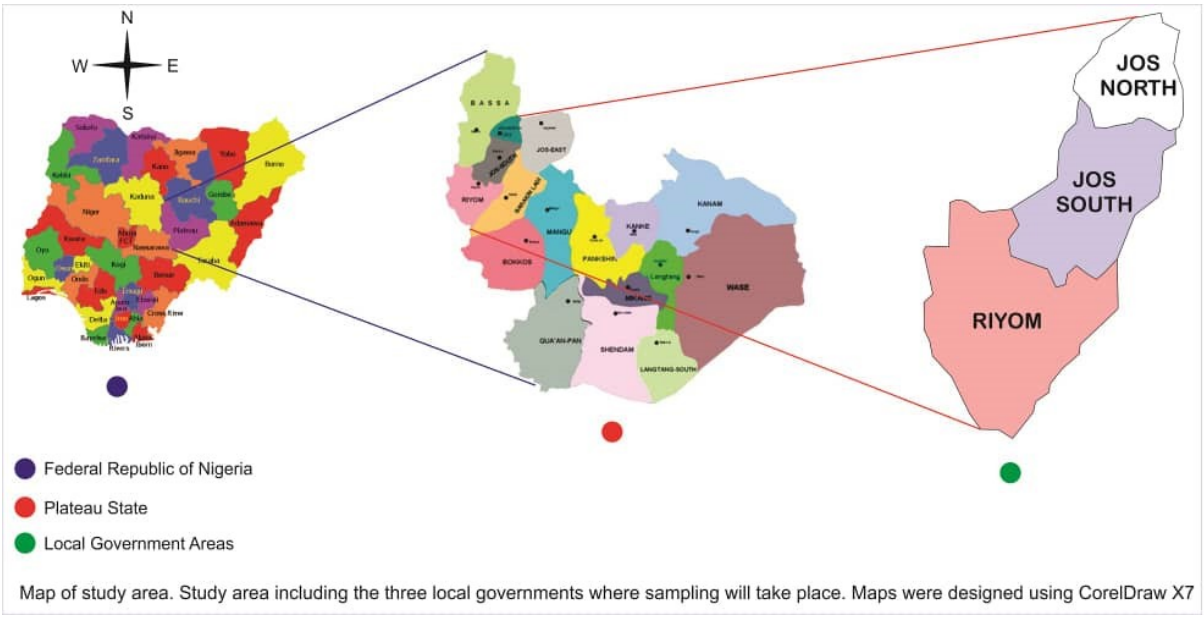

Figure 1:Maps of Nigeria and Plateau state- https://images.app.goo.gl/wKvbGRy9prnNuNsg9

2.2 Ethical Clearance

Ethical clearance was issued by the Animal Experimental Unit, University of Jos, Nigeria. Verbal consent was also obtained from animal owners and handlers.

2.3 Inclusion Criteria

This include horses of all ages, sex, breed and body condition.

2.4 Sample collection

107 horses of different breeds, gender and ages kept in different management systems were screened from October 2019 to February 2020. Faecal samples (about 5 grams) were collected from each horse directly from the rectum and from freshly dropped faeces during defecation using disposal plastic gloves and immediately kept in a cold pack. Each sample was labelled according to the name of the horse and all descriptions of the horse which include breed, age, and sex, were recorded corresponding to the name of each horse to exclude repetition of sample collection of the same horse. The samples were then transported to the National Veterinary Research Institute (NVRI) Parasitology unit for laboratory analysis. Samples were kept in the refrigerator at 4°C if immediate processing was not possible, but processed within 48 hours.

2.5 Laboratory Analysis

2.5.1 Floatation Technique: The flotation technique was carried out as described by [10] where 2 grams of each faecal sample was put in universal bottles and mixed with little quantities of saturated sodium chloride solution. This mixture was sieved into a test tube. The filtrate was filled to the brim (forming a meniscus) with more of the saturated sodium chloride solution and a clean cover slip was gently placed on top of the test tube whereby avoid-

ing spillage or bubbles. The cover slip was left for about 20 minutes; afterwards, the cover slip (having the harvested eggs) was placed on a clean glass slide for microscopic examination using X10 and X40 objectives.

2.5.2 Sedimentation Technique: The formalin-ethyl acetate concentration technique was carried out as described by [11] where about 2 grams of each faeces were dissolved in 10% formalin and sieved in to a plastic test tube to the 7 ml mark and allowed to stand for few minutes. Three (3) ml of ethyl acetate were added. The tube was closed, vigorously shaken by hand for 1 min and centrifuged at 3000rpm for 5 minutes. The debris plug was loosened and the top three layers were discarded. The entire sediment was examined on a clean glass slide and covered with a clean cover slip. All the processed samples were examined using 10X and 40X objective lenses. Parasites were identified as described by [10].

2.6 Data Analysis

The data was entered and organized in Microsoft Office Excel and analyzed using R Statistical Software (R Core Team 2019). A Chi-square test was used to test association in prevalence among the different risk factors (e.g. geographical location (Local Government Area), Age, Sex and Breed of horses. The association between these risk factors and the type of parasites were also tested in a Chi-square test. For ($\chi 2$) test, p-values <0.05 were considered significant whereas p-values >0.05 were considered non-significant.

3. RESULTS

Of the total 107 horses sampled, 50 horses were positive for gastrointestinal parasite infection. The overall prevalence of gastrointestinal parasites in the horses in the study area was found to be 46.7% (Table 1).

Table 1

Overall Prevalence of Gastrointestinal Parasites in Horses by Risk Factors

Risk factors	Number Examined	Number infected	Prevalence (%)	÷2 value (P-value)
Location				**5.7 (0.06)**
Jos North	80	42	39.3	
Jos South	12	2	1.9	
Riyom	15	6	5.6	
Total	107	50	46.7	
Breed				**6.2(0.18)**
Argentina	13	4	3.7	
Chad	7	4	3.7	
Local	32	12	11.2	
Sudan	48	28	26.2	
Tallon	7	2	1.9	
Total	107	50	46.7	
Sex				**2.9 (0.09)**
Female	58	32	29.9	
Male	49	18	16.8	
Total	107	50	46.7	
Age				**0.19(0.66)**
Adult	76	34	31.8	
Young	31	16	15.0	
Total	107	50	46.7	

Seven (7) different gastrointestinal parasites were observed in the animals studied: *Ascaris equorum* (12.1%), *Eimeria* spp (8.4%), *Fasciola* spp (3.7%), *Gastrodiscus aegyptiacus* (2.8%), *Strongyloides* spp (7.5%), *Strongylus* spp (11.2%) and *Trichomena* spp (14%). *Trichomena* spp, *Strongylus* spp (11.2%) and *Gastrodiscus aegyptiacus* 2.8% (Figure 2).

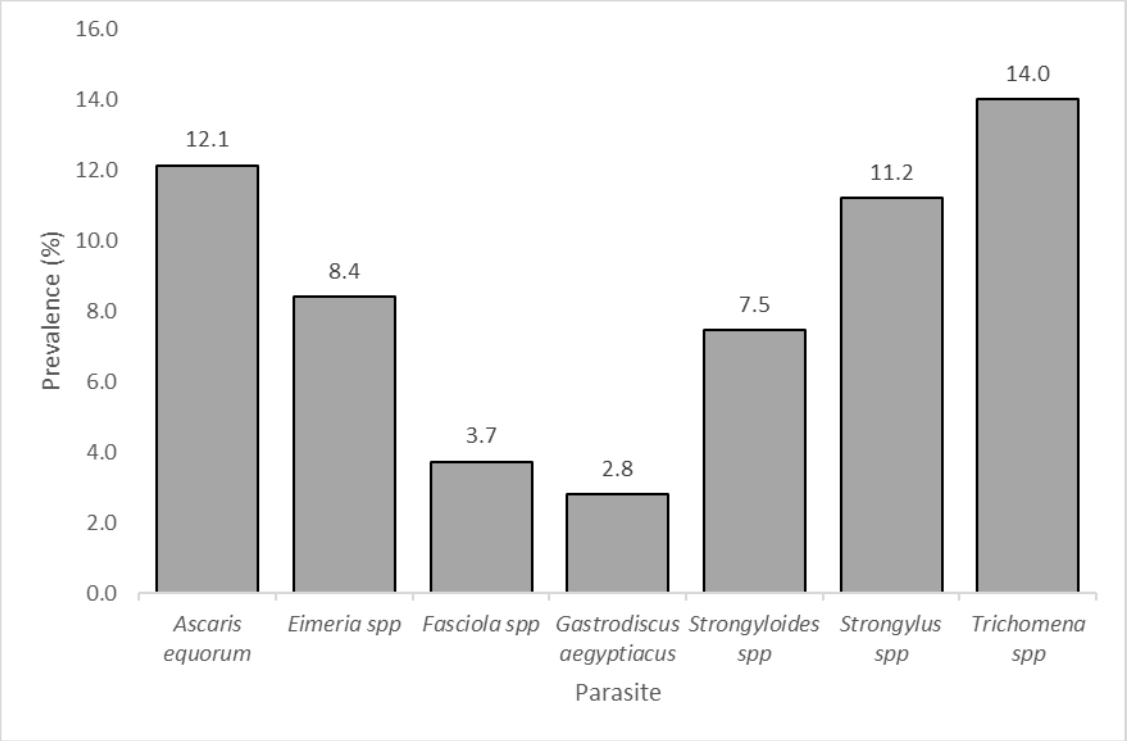

Figure 2: Prevalence of the seven (7) different gastrointestinal parasites observed in the study with *Trichomena spp* having the highest while *G. aegyptiacus* has the least.

Thirty-eight horses 35.5% showed infection with a single parasite species while twelve 11.2% horses were infected with more than one species of parasite (mixed infection). Prevalence varies significantly across parasites ($P<0.05$). *Strongylus* spp (9.3%) and *Trichomena* spp (9.3%) has the highest prevalence of single infection while Fasciola spp (0.9%) and *Gastrodiscus aegyptiacus* have the least prevalence of single infection (Table 2).

Table 2

Total number of horses, 107.

Parasites	No. infected	Prevalence (%)	**χ2 value = 20.4 P = 0.01**
Ascaris equorum	6	5.6	
Eimeria spp	7	6.5	
Fasciola spp	1	0.9	
Gastrodiscus aegyptiacus	1	0.9	
Strongyloides spp	3	2.8	
Strongylus spp	10	9.3	
Trichomena spp	10	9.3	
Mixed Infections	12	11.2	
Grand Total	50	46.7	

($\chi^2 = 20.4$, df = 7, P = 0.01)

Prevalence varies significantly across parasites

Prevalence for individual parasite and associated risk factors.

By age (young: 0-4 years, adult: above 4 years), there is no significant variation of infected horses between adults and young horses for each of the parasites, P>0.05 (Figure 3).

Prevalence for each parasite by location (LGA): going by location, there is a significant interaction between type of parasite infection and LGA, P<0.05 (Figure 4).

Between type of parasite infection and sex of horses, there is no significant interaction, P>0.05 (Figure 5).

Finally, there is no significant association between each parasite infection and breed of horses, P>0.05 (Figure 6).

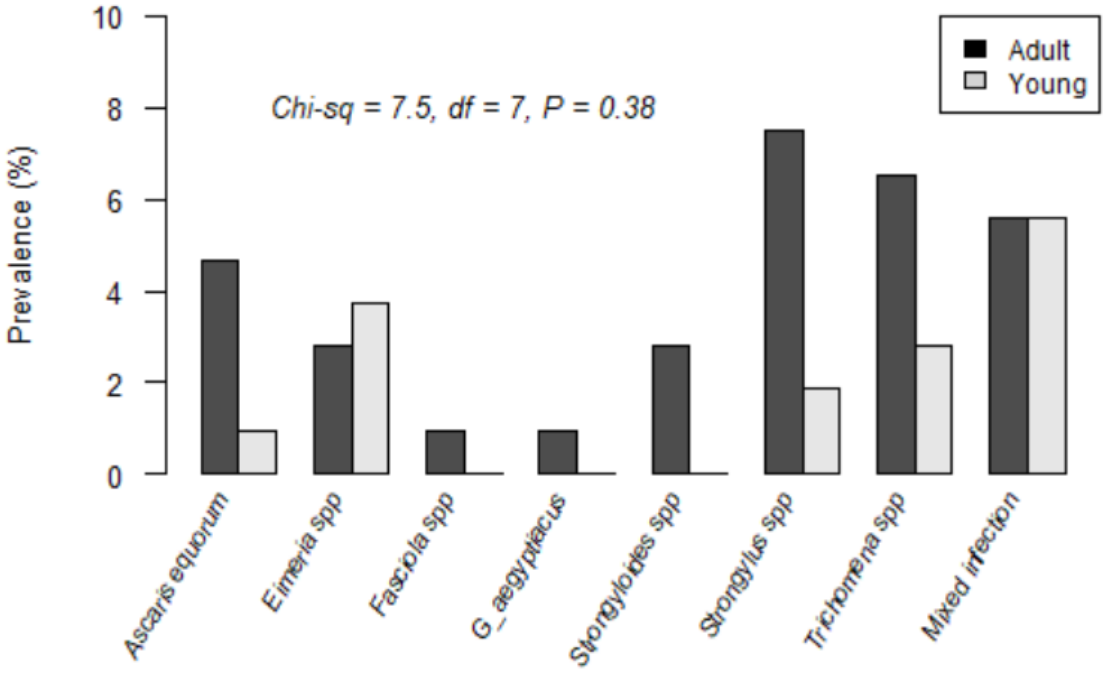

Figure 3: Prevalence of parasite by age (young: 0-4 years)

No significant variation in number of infected horses between adults and young horses for each of the parasites ($\chi 2 = 7.5$, df = 7, P = 0.38).

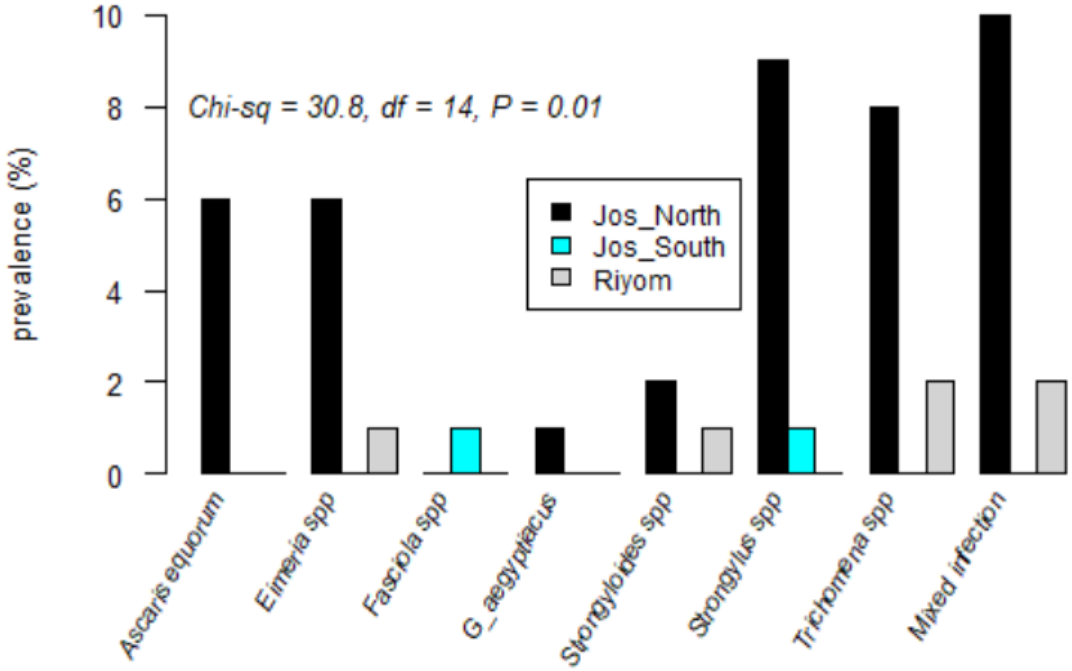

Figure 4:

Prevalence of parasite by LGA

There is a significant interaction between type of parasite infection and LGA where horses were sampled ($\chi 2 = 30.8$, df = 14, P = 0.01). More horses in Jos-North were infected by each of the parasites except for *Fasciola spp*

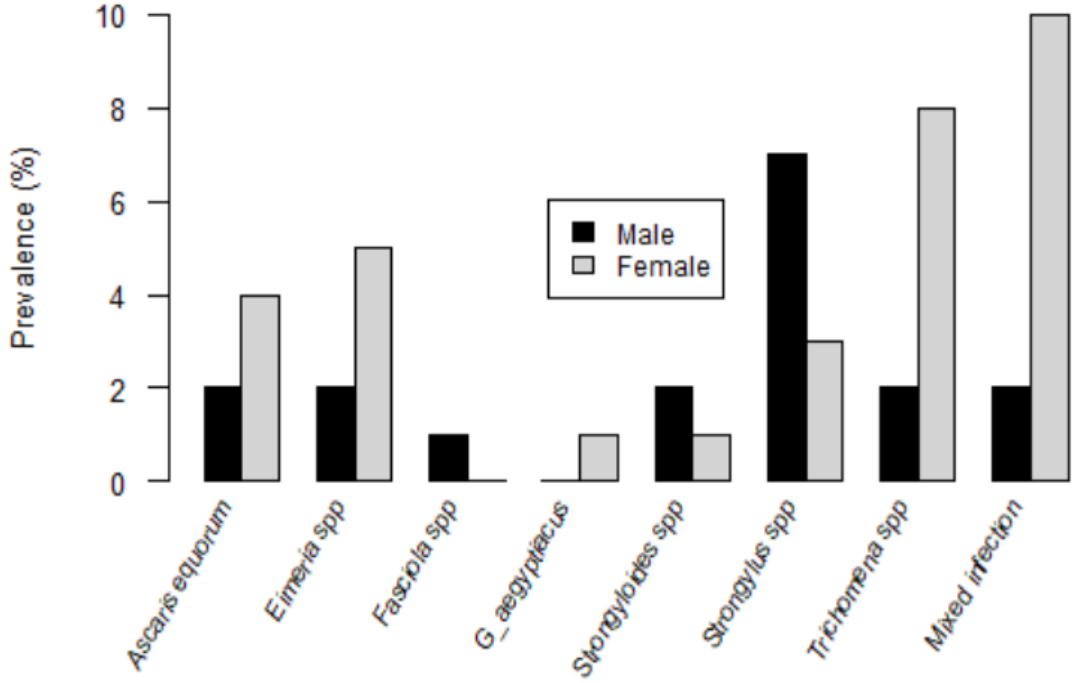

Figure 5: Prevalence by sex by parasite. There is no significant interaction between type of parasite infection and sex of the horses ($\chi 2 = 11.8$, df = 7, P=0.11)

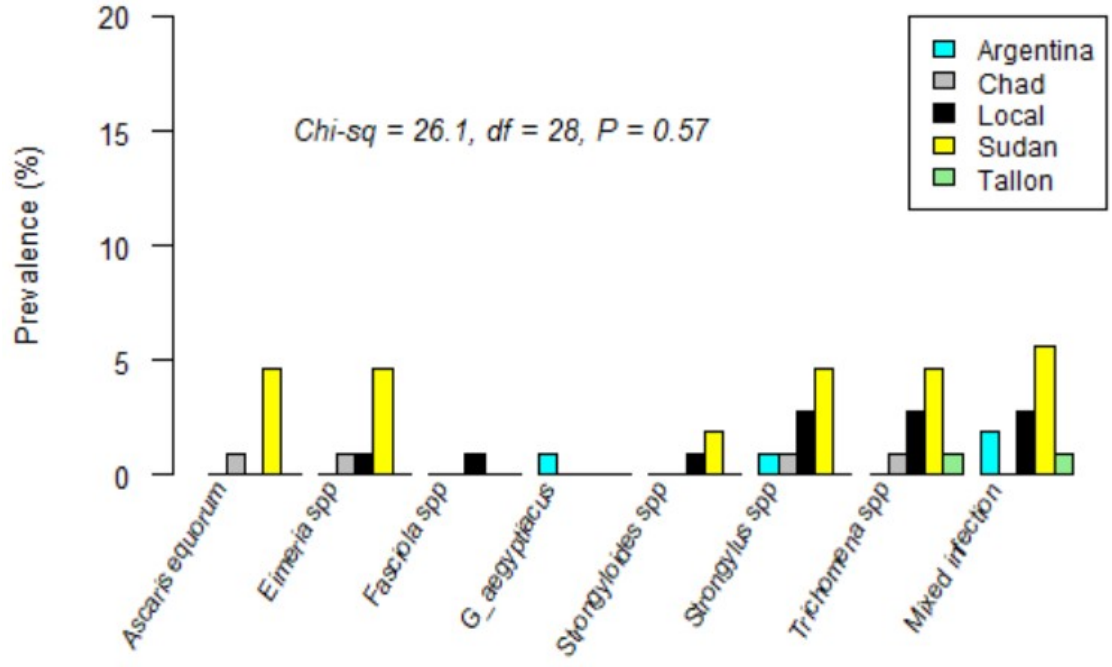

Figure 6: Prevalence of parasite by breed

There is no significant association between type of parasite infection and breed of the horses ($\chi 2 = 26.1$, df = 28, P = 0.57).

4.DISCUSSION

Seven different gastrointestinal parasites were observed in the animals studied: *Ascaris equorum* (12.1%), *Eimeria* spp (8.4%), *Fasciola* spp (3.7%), *Gastrodiscus aegyptiacus* (2.8%), *Strongyloides* spp (7.5%), *Strongylus* spp (11.2%) and *Trichomena* spp (14%). *Trichomena* spp showing highest prevalence of 14% followed by *Strongylus* spp (11.2%) and *Gastrodiscus aegyptiacus* with the least prevalence of 2.8%.

An overall prevalence of 46.7% was obtained. This is lower than previous studies conducted in Nigeria, where 62.8% was recorded in Kwara and Niger States [12], 70.8% recorded in Kaduna State [13], 74.7% recorded in Plateau State [14] and 76.1% recorded in Abuja, [3]. Lower prevalence of 28.5% has been reported in Romania [15], while higher prevalence of 80.9% and 84.7% had been recorded in Ethiopia [16] and [17] respectively.

The lower prevalence in this study can be attributed to the improved management practices and the fact that animal handlers are more enlightened about the use of regular dewormers and the need to ensure that their horses are kept in more hygienic environments. The differences in the prevalence could be attributed to the season of sampling, climatic and environmental differences, management practices, level of stable hygiene, breeding related conditions, diagnostic technique carried out, nutritional and immune status of the studied horses [12]. Also, sampling method and sample size.

The horses in this study, though confined to stables are occasionally allowed to graze in open fields or on hand cut grasses to supplement the feed usually fed to the animals. When contaminated, the pasture environment or hand cut grasses could result in infection or re-infection of susceptible animals even after a regular treatment regimen. During the course of sample collection, it was observed that some of the horses were allowed to graze alongside other animal species like sheep, cows and goats. This may have resulted to infections like Fasciolosis seen in the study. It was also observed that during Polo game festivals, horses from stables in other parts of the country were introduced into the existing herd without quarantine to participate in such games. This could attribute to introduction of parasites from other areas into an otherwise healthy flock, leading to an increased rate of infection of the horse [3]. Comparison was made regarding prevalence with respect to location, age, sex and breed.

From the seven different parasites identified, *Trichomena* spp with the highest prevalence, agrees with the work of [18] and disagrees with the works of [14] and [5] who reported predomination of *Triodontophorus tenuicollis* and Strongyle type of eggs respectively. The second and third predominant parasites in the study recorded are *Ascaris equorum*

(12.1%) and *Strongylus* spp (11.2%). This is also different from previous studies done by [12] *Eimeria spp* and *Trichostrongylus axei* as second and third prevalent. Also, study conducted by [3] recorded *Strongyloides spp* and *Oxyuris spp* as second and third most prevalent parasites. These differences could originate from different management systems, difference in season of sampling, climatic and environmental differences. The least prevalent helminth seen in the study is *Gastrodiscus aegyptiacus* (2.8%). This concurs with the study reported by [14].

In this study, there was a significant difference $P<0.05$ between type of parasite infection and Local Government Area where horses were sampled. This can partly be attributed to the difference in sample size at the study areas. More samples were gotten from Jos North LGA compared to Jos South and Riyom.

It was seen that though there was no significant difference ($P>0.05$) between the prevalence of parasites in young and adult horses, high prevalence of gastrointestinal parasites was seen in the adult horses, this finding agrees with the work of [18]. For this, the probable reason may be due to waning body conditions and immunity. Compared to the young equines, the immunity of the old equines is low as they are frequently exposed to different parasites, extensive work overload and undernourished conditions [18].

Sex-wise, female horses were found to have higher infection of parasites than males. This might be as a result of female horses having lower immunity due to gestation, lactation and related stresses [19]. However; no significant difference ($P>0.05$) was observed between the two sexes. Generally, it is assumed that sex is a determinant factor that influences the prevalence of parasitism [20].

5 CONCLUSION.

The study revealed that *Trichomena spp* was the most prevalent parasite followed by *Strongylus spp*. It also showed that gastro intestinal tract helminth parasites are an important health problem in the area affecting the well-being and productivity of horses. However, there has been an improvement in the management practices as seen in the prevalence of this study compared to studies previously conducted in Plateau State.

Since gastrointestinal helminth infection has great economic importance in horses, the following recommendations are necessary to ensure that infection rate is reduced to the barest minimum: regular and strategic deworming programs with efficacious anthelminthics should be carried out regularly. Adequate housing and feeding management system should be implemented to decrease the incidence of parasites in horses.

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