OVERVIEW OF SEASONAL PREVALENCE OF LIVER FLUKE & RUMEN FLUKE INFESTATION IN CATTLE AND BUFFALO OF WESTERN CHITWAN, NEPAL

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ABSTRACT

Fluke infestation in domestic animals is one of the major problems of farmers in tropical condition of Chitwan. A prospective study was done in western Chitwan, Bharatpur Metropolitan City, ward 26&16, Nepal in two different seasons-summer and winter to describe the seasonal prevalence of fluke infestation in dairy cattle and buffalo. Sedimentation technique of faecal examination was performed to recover the parasite eggs. In the study, the prevalence of fluke infestation was found to be higher in the summer (26%) than in winter (22%). Similarly, among cattle Jersey cross (39.5%) showed the highest infestation of flukes among the breeds followed by Jersey (12.5%), among the buffalo breed the rate of infestation was found higher in Murrah cross (21.4%) followed by local (20.0%). No Murrah breed in the study were positive for GI parasite. In the study carried out in 38 calf, 7 heifer and 55 mother the faecal examination for fluke egg was positive 26.3% of calves, 28.6% of heifers and 21.8% of mothers respectively. Out of 43 buffalo and 57 cattle the parasitic infestation was found in 18.6% and 28.1% of sample respectively. Although cattle were seen more susceptible to flukes, the relation was not statistically significant. The study shows that the fluke infestation may be producing subsequent production loss due to its high prevalence in dairy cattle and buffalo.

Keywords: Fasciolosis, Paramphistomiasis, Seasonal prevalence, Western Chitwan

INTRODUCTION

Trematodes commonly called as flukes are member of class trematode. Freshwater snail around chitwan district are largely infested with trematode cercaria, majority of them being amphistoms and fascolid along with four other species (Devkota, Budha, & Gupta, 2011).Fluke is one of the major causes of economic losses in farm animals, commonly found flukes being liver fluke and rumen fluke. Fasciolosis is a disease predominantly found in ruminants and wildlife. *Fasciola hepatica* and *Fasciola gigantica* are the two main species responsible for most infections (Jaja, Mushonga, Green, & Muchenje, 2017). The infection causes massive loss through liver condemnation, reduced production of milk, meat, and wool, veterinary care, metabolic disease as well as mortality (Khanjari *et al.,* 2014,). Livestock become infected by ingesting the infective stage, the metacercaria, which contaminates grass and other vegetation. These hatch in small intestine and migrate directly to liver. The juvenile flukes thus migrate through liver tissues, feeding and growing until they reach bile ducts. (Kaplan, 2001) The intermediate host is a mud snail called *Galba truncatula,* which is commonly found in ditches and marshy lands. The pathological manifestation of fasciolosis depends upon the number of metacercaria ingested and the most damaging stage is six to eight-week-old trematode. During acute fasciolosis evidence of traumatic hepatitis and fibrinous clot on liver surface is seen, liver is mostly enlarged. Animals often decline to move and are anorexic. In case of chronic fasciolosis traumatic destruction and coagulative necrosis of liver parenchyma is seen. There are also reports of fascioliasis in sites other than liver, such as subcutaneous tissues and epididymis, brain, lungs,

stomach and caecum (Gajewska, Smaga-Kozłowska, & Wiśniewski, 2005).The most often clinical signs associated with fasciolosis is intermittent soft feces, occasional profuse diarrhoea, progressive loss of weight, bottle jaw and pale mucous membrane.(Ballweber, n.d.-a)Fascioliasis is a zoonotic disease that infects wide varieties of mammalian hosts all around the world (Cwiklinski, O'Neill, Donnelly, & Dalton, 2016).

There are 12 subspecies of Paramphistomum found throughout the world. Among them 11 different subspecies including *C.cotylophoron, C.fuelleborni, C.synethes, C. microbothrium*are found in Chitwan (Rana, 1997).The lifecycle is similar to Fasciola except the intermediate hosts are snails of genus*lymnea, Pygmanisas, Fossaria*(López, Romero, & Velásquez, 2008). The adult Paramphistomes are relatively non-pathogenic and at most may cause localised loss of rumen papillae. The immature ones may cause superficial haemorrhages in bile duct and gall bladder. In heavy infection liver may be pale and show slight fibrosis. The duodenum and upper ilium are most affected organs due to Paramphistomiasis. The flukes are embedded in mucosa and feed on the mucous plug causing necrosis and haemorrhages. Clinical signs of paramphistomiasis consist of profuse fluid fetid diarrhoea, anaemia, hypoproteinemia, edema and emaciation(Ballweber, n.d.-b). Animal shows marked weakness and frequent death. Beside animals are thirsty and drink frequently. Severe chronic fluke infestation in dairy cattle is associated with reduced milk yield, poor fertility and excessive weight loss. In heifer it may cause debilitation with increased incidence of metabolic and infectious disease at calving. In addition, flukes are also shown to modulate the hosts immune system, increasing susceptibility to other infectious agents(Khoramian *et al.,* 2014).

In a study by (Gautam, Devkota, & Thapaliya, 2017) in Chitwan reported that 41.7% (242 out of 581) fecal samples of farm animals were positive for nematode infestation.Thus, the primary objective of the study was to describe the seasonal prevalence of rumen and liver fluke in cattle reared for dairy purposes in western Chitwan.

MATERIALS AND METHODS

Study Area

Cross section studies were conducted in western Chitwan in two different seasons to describe the seasonal prevalence of fluke infestation in cattle and buffalo. Geographically Chitwan is located in mid-southern part of Nepal with tropical climate with four different seasons,Winter (December-February), Spring (March-May), Summer (June-August) and Autumn (September-November) with coordinates 27.5291° N, 84.3542° E. The summer study was done at Bharatpur Metropolitancity-26 during the month of August and winter study at Bharatpur Metropolitan city-16 during the month of January. Both the sites are within the radius of 10 km. The animals used for the study were kept for dairy purpose and most of the adult ones were lactating. They were mostly stall fed based on cut and carry system. Most of the animals used for the study were healthy and didn't show any significant clinical signs of parasitic infestation however some of them were emaciated. Most of the farmers were aware of the use of antihelminth and few of them were using them on regular basis. Animals were allowed to graze on the field when the fields were clear after the crops were harvested.

Sampling and Sampling Techniques

Cross section study was done for the purpose. A total of 100 animals kept for dairy purpose were randomlyselected from two different villages in two different seasons. The Animals were grouped as-

a. Calf: 0-1 years old

b. Heifer: 1-till first parturition
c. Mother: After first parturition

Sample Distribution:

d. Summer(n=50) and Winter(n=50)
e. Cattle(n=57) and Buffalo(n=43)
f. Among cattle, calf(n=17), heifer(n=4) and mother(n=36)
g. Among buffalo calf(n=21), heifer(n=3) and mother(n=19)
h. Overall, calf(n=38), heifer(n=7) and mother(n=55)

Data Collection

Related information of the animal was obtained by face to face interview of the owner using a predesigned closed type questionnaire.

The sampled animals were visited and fresh faecal sample was collected. The sample was then collected in sterile polythene bag labelled with unique identity number. All the samples were transported to nearby examination camp for evaluation. Most of the samples were examined within 2 hours of the collection. 10% formalin solution was added to avoid hatching of eggs if the samples had to be stored longer.

The faecal sample was qualitatively examined for the presence of fluke egg. Recovery of liver and rumen fluke egg was done using sedimentation technique as described by (Bhatia *et al.,* 2012). Where the fecal sample was sedimented in normal and parasitic eggs were recovered after 2-3 wash. 2 slides were prepared for each sample and examined individually. The egg/larva stained by methylene blue as examined under microscope was compared with a standard printed figure of the eggs of the parasite.

All the data from questionnaire survey and faecal examination was entered in MS excel 2016, after checking for any duplication of data it was exported to IBM SPSS 24. Chi square test was performed for hypothesis testing.

RESULT AND DISCUSSION

The study shows Cattle (28.1%) were infested in high number than Buffalo(18.6%) (table 1). The overall prevalence of Rumen and Liver Fluke in the study was 24%. There was no significant statistical relation between species and parasitic infestation (P>0.05). The overall fluke prevalence was 24% in cattle and buffalo kept for dairy purpose. A total of 24 out of 100 faecal samples were positive for fluke eggs among them 8 out of 43 buffalo faecal samples and 16 out of 57 bovine faecal samples were found positive for fluke eggs.

Table 1: Species variation of liver & rumen fluke infestation as studied by fecal sedimentation method

	Buffalo	Cattle	Total	P-Value
Samples Taken	43	57	100	
Samples with Parasitic Infestation	8	16	24	
% of Infestation (within species)	18.6%	28.1%	24.0%	
% of Infestation (within result)	33.3%	66.7%	100.0%	1.204

The result obtained is lower than that reported by (Yeneneh, *et al.,* 2012) who reported overall prevalence of fluke prevalence in cattle as 60.42% (232 out of 384) in Ethiopia. The higher rate of

incidence may be due to the fact that the samples used in our study were apparently healthy and no clinical signs and symptoms related to parasitic infestation was observed. Similarly, in another study by (Maqbool & Hayat, 2002) the overall prevalence of fascioliasis in Buffalo was reported to be 14.71% (3226 out of 21928) in the epidemiological survey at Pakistan which is closer to our result. In our study, Cattle showed higher percentage of infestation than Buffalo. The reason for this might be the difference in the shedding pattern of the parasitic egg in the feces. Cattle shed more eggs in the feces than buffalos as reported by J.W. *et al.,* (2017).

From the study, Cross breed species, Jersey Cross and Murrah Cross showed higher rate of fluke infestation then pure breed. Jersey (12.5%), Jersey Cross (39.4%), Local buffalo breed(20.0%) and Murrah Cross breed (21.4%) were fluke infested (table 2).

Table 2: Breed variation of liver & rumen fluke infestation as studied by fecal sedimentation method

	Cattle		Buffalo				P-Value
	Jersey	Jersey Cross	Local	Murrah	Murrah Cross	Total	
Samples Taken	24	33	25	4	14	100	
Samples with Parasitic Infestation	3	13	5	0	3	24	
% of infestation (within breed)	12.5%	39.4%	20.0%	0.0%	21.4%	24%	0.105
% of infestation (within result)	12.5%	54.2%	20.0%	0.0%	12.5%	100%	

Similar finding was obtained by (Sardar *et al.,* 2016) who reported the infestation of fasciola in 25% of native cattle while it was 30.56% in the cross-breed cattle. He also reported 45.28% sample were infestedby Paramphistomum in the native breed and 51.11% in the cross breeds.

The higher but statically no significant relation between the breed and fluke infestation in cross breed may be due to the loss of genetic resistance of the breed against the parasite. In the crossing of breeds there are some traits which are distinctly raised in the quantitative and qualitative aspects, but there are traits which are suppressed. There might be the suppression of the genetic resistance of the pure breeds against the parasite.

The infestation was higher in summer than in winter. During summer the infestation of rumen and liver fluke was positive for 26% of samples whereas during winter the infestation was positive for 22% of samples. Although there was no significant statistical relation between season and fluke infestation $P > 0.05$ (table 3).

Table 3: Seasonal variation of liver & rumen fluke infestation as studied by fecal sedimentation method

	Summer	Winter	Total	P-value
Samples Taken	50	50	100	
Samples with Parasitic Infestation	13	11	24	
% of Infestation (within season)	26.0%	22.0%	24.0%	0.219
% of infestation (within result)	54.2%	45.8%	100.0%	

The present study agrees with the finding of (Akanda *et al.,* 2014)**,** who reported that parasitic infestation was highest in rainy season followed by summer and winter season. The findings of our study also agree with the findings of (Jeyathilakan N, *et al.,* 2015) and (S.A. Sardar, *et al.,* 2016). (Jaja *et al.,* 2017) also reported higher (10.4%) infestation of Fasciola in summer as compared to winter in bovine. The higher parasitic infestation in cattle in summer season may be due to the availability of moisture in the environment and the dung where the growth of infective stage of the parasite occurs. The optimum temperature required for the reproduction of snail is also suitable during the summer. But our finding does not agree with the findings of (Chavhan *et al.,* 2008) who reported higher prevalence of nematode infestation in winter (32.22%) as compared to summer (21.33%).

Age wise prevalence of rumen and liver fluke was distributed as Calf(26.3%), Heifer (28.6%), Mother (21.8%). The relation is statistically non-significant (P>0.05) (table 4).

Table 4: Age Group variation of liver & rumen fluke infestation as studied by fecal sedimentation method

	Calf	Heifer	Mother	Total	P-Value
Samples Taken	38	7	55	100	
Samples with Parasitic Infestation	10	2	12	24	
% of infestation (within age group)	26.3%	28.6%	21.8%	24.0%	
% of infestation (within result)	41.7%	8.3%	50.0%	100.0%	0.335

Our result agrees with the findings of (Nath *et al.,* 2016) who showed the infestation was higher in younger calves compared to older ones. This result was in contradiction with the findings (Dhakal, and Nepali, 1984) and (Sardar, *et al.,* 2016) who found adult more susceptible to infestation. Young animals are more susceptible to parasitic infection than adult (Khan *et al*, 2017). This higher infestation of parasite in the young can be due the inadequate immunity against the parasite than that of the adult. The adult animals might have developed immunity against the parasitic infestation due the previous exposure with the parasites.

There is relation between the breed, season, species, and age group with the fluke infestation in Gastro Intestinal tract. These relations simply reflect the interaction of the genetics of the animal, environment in which the animal is living, feeding habit of animal and the immunological maturity of the animal to eradicate the effects of parasitic infestation.

CONCLUSION

This study reveals the overall fluke infestation in cattle and buffalo kept for dairy purpose reared under intensive and semi-intensive feeding system. Although fluke infestation may depend on factors like species, breed, age-group and season, the study showed them statistically insignificant. The lack of proper knowledge of farmers about the dosing and frequency of antihelminth may be one of predisposing factors for high rate of incidence. The study also supports to the fact that fluke infestation is one of the major problem of farmers of Chitwan district. Since the study was conducted with a small sample size, a detailed study regarding the subject is required to the extent of problem in detail. Never the less this study may be informative to know the overall and seasonal difference on fluke infestation in cattle and buffalo of western Chitwan.

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