PREVALENCE OF FASCIOLOSIS IN COMMERCIAL CATTLE FARM OF TILOTTAMA MUNICIPALITY, RUPANDEHI, NEPAL

N. Bhusal*, B.R. Bhatta, S. Shrestha and A. Chapagain
Institute of Agriculture and Animal Science, Tribhuvan University, Nepal
*nishimbhusal017@gmail.com

ABSTRACT

Fasciolosis is a common parasitic disease affecting cattle and other ruminants, caused by *Fasciola hepatica* and *Fasciola gigantic*a. The disease is widely distributed and can cause extensive economic losses to the farmers and the national economy. A cross sectional study was conducted to determine the prevalence of fasciolosis in commercial cattle farms of Tilottama Municipality, Rupandehi district, Nepal. A total of 270 fresh faecal samples were collected purposively from the study area with different ages, sex, stages, and breeds for faecal examination (sedimentation method) to diagnose eggs of Fasciola in the collected samples. The obtained data were coded and analysed using Microsoft Excel 2016. The overall prevalence of fasciolosis in cattle was found 15.56%. Age and sex wise prevalence was found statistically significant ($P<0.05$) while stage and breed wise prevalence was insignificant ($P>0.05$). Therefore, fasciolosis is prevalent moderately among cattle in Tillottoma municipality, which necessitates the study of detailed epidemiology of the disease and effective control strategies against it in order to prevent huge economic losses.

Keywords: *cattle, fasciolosis, prevalence*

INTRODUCTION

With over 7 million cattle and 5 million buffaloes, Nepal dense bovine population per capita. Cattle is one of the most important livestock in Nepalese society for milk and manure as well as possess religious importance (Bhatta et al., 2018), and parasitic infection causes great economic loss (Yadav et al., 2015). Among the parasitic infestation, fasciolosis is a most widespread parasitic disease in the world, affecting cattle and other ruminants (Boray, 1981, cited by Gonzalez et al., 1989) and has a significant contributory role in national economic condition across the globe (Choubisa and Jaroli, 2013). According to Mas-Coma, Bargues and Valero (2005), 300 million bovines are exposed to fasciolosis worldwide with prevalence greater than 30%. Also, in Nepal, fasciolosis is the most common disease of all species of ruminant including Yak and Yakows of the Himalaya (Joshi and Tiwari, 1975). According to Singh et al. (1973), annual economic loss is estimated to be US $200 million due to fasciolosis. Similarly, Mahato (1993) also estimated that there is an annual loss of US$ 16.85 million to national economy of Nepal due to Fasciolosis. The disease is caused by digenetic trematode of genus *Fasciola,* which inhabit in the bile duct, so called liver fluke (Soulsby, 1968). *Fasciola hepatica* and *F. gigantica* are the main species that infect cattle, of which first predominate in temperate region and later in mainly tropical regions (Andrews, 1999, Bennema et al., 2014). Both species of *Fasciola* are transmitted by the snails of Lymnaeidae family (Soulsby, 1968). In livestock, fasciolosis cause mortality in acute cases while weight loss, infertility and reduced production in chronic cases (Siddiki et al., 2010); symptoms include anorexia followed by anaemia, hypoproteinemia, bottle jaw condition, reduced body weight, decrease rectal temperature and ruminal motility, reduced serum Cu, Fe, Mg, increased heart and respiration rates, which are controlled by treatment but if left untreated for prolonged period, leads to serious condition (Pachauri, 1995 cited by Gupta and Singh, 2002). There are several methods available for the diagnosis of fasciolosis

through immunological and molecular techniques; however, detection of eggs by faecal examination techniques is taken as the gold standard for the diagnosis of trematode infection like fasciolosis (Esteban et al., 2014).

This study aims to provide information on the prevalence rate of fasciolosis among cattle population in commercial cattle farms of Tilottama municipality in Rupandehi district of Nepal and investigate the association of age, stage, sex and breed on prevalence of fasciolosis among sampled population.

MATERIALS AND METHODS

Study area, sample size and sampling

The study was conducted in Tilottama Municipaity, Rupandehi district which lies in Lumbini Province of Nepal. This area lies on the south-western part of Nepal in an altitude between 1000 m to 1229 m from sea level and experiences tropical climatic condition exceeding 40' in summer. The district has a total area of 1,360 km² with 16.1% in Churia Range and rest in the Terai region.

Sample size was calculated according to the Daniel's formula: $N = Z^2 P (1-P) /d^2$ (Daniel, 1999). The expected prevalence (P) of 50% was used with accuracy of precision (d) of 0.05 and Z – value of 1.96, as suggested by Niang et al. (2006) for any unknown prevalence or that ranging from 10% to 90%. Also, according to a study done in Dhanusha and Mahottari district of Nepal, having similar tropical climatic condition to the study area, the prevalence of *Fasciola* in local breed of cattle was 51% (Yadav et al., 2015). Thus, the sample size obtained was 385, however, only 270 samples were collected due to lack of adequate time. Purposive sampling was done followed by analysis starting from July, 2019 to September, 2019 (3 month). A total of 270 faecal samples along with individual animal data were collected from the commercial cattle farm of Tilottama municipality basing on different age, stage, sex and breed using structured record keeping sheet through physical inspection and face to face interview with the owners. About 30-60 gm faecal sample were collected rectally by using hands as well as recently excreted fresh faeces during time period of 8 AM – 1 PM local time, which were kept in plastic zipper bag, and in case of dry faeces moistened by normal saline, in cool box and brought to lab within 6-8 hour of collection and kept in refrigeration until when sample checked but no longer than 7 days. The samples were grouped as:

Based on Age: Upto 1yr. (n=26), 1 to 2 yr. (n=24), 2 to 3 yr. (n=52), 3 to 4 yr. (n=42), Above 4 yr. (n=126)
Based on sex: Male (n=14), Female (n=256)
Based on breed: local (n=16), exotic (n=254)
Based on Stage: Calf (n=44), Heifer (n=36), productive (n=190)

Sample analysis

For laboratory analysis of the faecal samples, simple sedimentation technique was used as described by Soulsby (1983): 5-6gm of fecal sample was homogenized with 150-200ml tap water in mortar and minced by pestle and placed in 250 ml cheaper plastic cup, water added and strained through tea strainer, then sedimented for 15 minutes. Supernatant was discarded, again water was added and sedimented till supernatant was clear. Finally, 1-2 drop of sediment was taken in slide with the help of transfer plastic pipette and covered with coverslip and observed in microscope in 100X magnification.

For statistical analysis, data obtained were coded and analysed in MS-EXCEL 2016. Overall prevalence of fasciolosis along with variations on the basis of different age groups, sex, breeds and stages were calculated and their association with the infection was observed using values of P from chi square test ($P<0.05$ were considered significant at 95% level of confidence).

RESULTS AND DISCUSSION

This study shows that among 270 set of examined samples, 42 were found positive for *Fasciola* eggs establishing an overall prevalence rate of 15.56%. The result was lower than the previous study done by Yadav et al. (2015), who found 52% prevalence of *Fasciola* in Mahottari and Dhanusa District; Sardar et al. (2006) who found 25% in Trishal Upazilla, Bangladesh. This may be due to the animal husbandry condition. Here, the studied population are absolutely from commercial cattle farms where they are stall fed and are deprived of free ranged grazing practice. In support, the prevalence is notably lower in tethered compared to free ranged which may be due to less exposure with contact to the risk factors such as the presence of metacercaria in the grazing land (Yadav et al. 2015). However, our result was similar to that with Islam et al. (2016) who found overall prevalence of 18.64% fasciolosis in cattle in Sylhet division of Bangladesh. Certain risk factors such as previous infections, contaminated feed, etc. may be involved for the presence of *Fasciola* infection in farms on which the animals are not grazed. It is possible that there may be persisting infection in the non-grazing farm prior to the time of study as *F. hepatica* is known to persist for as long as 26 months after infection (Ross, 1968). Other routes of infection such as metacercariae contaminated water as well as freshly cut grass and hay are also possible (Boray, 1969).

There was no significant statistical relation between stage and breed. But there was significant statistical relation between age and sex ($P<0.05$).

Effect of age

This result shows significantly higher prevalence ($P<0.05$) in 1-2 year old (33.33%) which is supported by Howlader et al. (2017) as well as by Alemnen & Ayelign (2017) which shows higher prevalence in 1-5 year old. Higher infestation of parasite in the young can be due the inadequate immunity against the parasite than the adult. In support, young animals are more susceptible to parasitic infestation than adult (Khan, 2017). On the other hand, the adult animals might have developed immunity against the parasitic infestation due the previous exposure with the parasites (Bista et al., 2018). Likewise, according to Winkler (1982), the host may recover from parasitic infection with increasing age and hence become resistant. However, our results contradicted with results finding of Karim, Mahmud & Giasuddin (2015), Isah (2019) and Bhutto et al. (2012) which shows higher prevalence of fasciolosis in older than younger cattle. Other studies show prevalence of 68.08% in old and 55.62% in adult (Ayele, Wondmnew and Tarekegn, 2018). Similarly, Simbwa, Baluka and Ocaido (2014) found 44.8% in adults and 31.8% in sub adults and Japa, Siriwechviriya and Prakhammin (2020) found more in > 4 years old (17.1%) and low in 2-4 years old (5.6%).

Table 1. Age wise prevalence of fascioliasis

	Up to 1 Year	1 to 2 year	2 to 3 year	3 to 4 year	Above 4 year	Total	P value
Sample taken	26	24	52	42	126	270	
Sample with parasitic infestation	2	8	4	6	22	42	
% of infestation (within age)	7.692	33.33	7.692	14.29	17.46	15.56	
% of infestation (within result)	4.762	19.05	9.524	14.29	52.38	100	0.043

Effect of sex

The sex wise study shows significantly higher incidence (P<0.05) in male (42.86%) than in female (14.06%) which is supported by Humbal et al. (2020), Japa, Siriwechviriya and Prakhammin (2020) and Isah (2019), whereas contradicted with Ayele, Wondmnew and Tarekegn (2018) and Swarnakar and Sanger (2014) which shows more *Fasciola* infestation in female and less in male and stated that female animals at different reproductive physiological state such as pregnancy and lactation are immunologically suppressed from increased blood cortisol level which favours the chance of exposure of females to *Fasciola* infection (Ayele et al., 2018). However, result obtained by Iboyi et al. (2017) shows no significant difference between infection of males and females. Therefore, lower prevalence in female in our study can either be due to the significant difference in the number of animals examined or the fact that estrogen stimulates the level of Reticulo Endothelial System (RES) in the animal body as well as induces the blood clearance rate and increase the number of phagocytes cells in liver, ultimately enhancing the immune system of female cattle (Humbal et al., 2020).

Table 2. Sex wise prevalence of fascioliasis

	Male	Female	Total	P Value
Sample taken	14	256	270	
Sample with parasitic infestation	6	36	42	
% of infestation (within sex)	42.86	14.06	15.56	
% of infestation (within result)	14.29	85.71	100	0.004

Effect of stage

From our study, stage wise prevalence is statistically insignificant (P>0.05), though higher incidence was seen in calves (18.75%) and lower in productive (14.71%). Our results agree with the findings of (Nath et al., 2016) and Bista et al. (2018) who showed the infestation was higher in younger calves. But result was in contradiction to Dhakal, and Nepali (1984), and Sardar, *et al.*(2006) who found adult lactating cattle more susceptible to infestation. The potential explanation to this is calves have less immunity to fight against diseases in comparison to heifers and adult animals under production. In addition, the cattle under production might have received more care and sanitation management from the farmers as they are lactating and are the direct source of income for the farmers, which ultimately resulted to lower prevalence as compared to heifers and calves.

Table 3. Stage wise prevalence of fascioliasis

	Calf	Heifer	Productive	Total	P value
Sample taken	32	34	204	270	
Sample with parasitic infestation	6	6	30	42	
% of infestation (within stage)	18.75	17.65	14.71	15.56	
% of infestation (within result)	14.29	14.29	71.43	100	0.789

Effect of breed

Higher prevalence of fasciolosis was found in improved/cross breeds (15.75%) than local breeds (12.5%). This result is supported by Simbwa, Baluka and Ocaido (2014) who found 54.8% in exotic and 25.5% in local and contradicted by Japa, Siriwechviriya and Prakhammin (2020) who found more incidences in local (9.6%) than in cross breed (5.3%). However, in our study, the association of breed with the infestation was not statistically significant (P>0.05). Although relatively equivalent number of samples of local breeds should be tested for more accurate result, the genetic variation and immune characteristics of local breeds could be the potential factors for lower incidence.

Table 4. Breed wise prevalence of fascioliasis

	Local	**Improved/ cross**	**Total**	**P value**
Sample taken	16	254	270	
Sample with parasitic infestation	2	40	42	
% of infestation (within breed)	12.50	15.75	15.56	
% of infestation (within result)	4.76	95.24	100	0.556

CONCLUSION

To sum up, the outcome of this study revealed the moderate presence of liver fluke infestation in cattle kept for dairy purpose reared under intensive feeding system. The study provided information on the nature of fasciolosis in the locality showing association with risk factors: age and sex, while breed and stage of animals were not found to be associated. Also, certain risk factors such as previous infections, contaminated feed and water, etc. could have been involved for the presence of *Fasciola* infection in these farms on which the animals are not grazed. Lastly, detailed study on epidemiology of fasciolosis and effective control strategies against it is necessary in order to prevent huge economic losses in Nepal.

REFERENCES

Alemneh, T., & Ayelign, M. (2017). Study on prevalence and economic importance of bovine fasciolosis in three districts of north-east Amhara region, Ethiopia. *Journal of infectious and Non Infectious Disease*, 3, 0-24. Doi: 10.24966/INID-8654/100024

Andrews, S.J. (1999). The life Cycle of *Fasciola hepatica*. In Fasciolosis, *Bulletin of Animal Health and Production in Africa,* 23(1), 57-86.

Ayele, Y., Wondmnew, F., & Yeshiwas, T. (2018). The Prevalence of Bovine and Ovine Fasciolosis and the Associated Economic Loss Due to Liver Condemnation in and around Debire Birhan, Ethiopia. *SOJ Immunology,* 6(3), 1-11.

Bennema, S.C., Scholte, R.G.C., Molento, M.B., Medeiros, C., & Carvalho, O.S. (2014). *Fasciola hepatica* in bovines in Brazil: data availability and spatial distribution. *Rev. Inst. Med. trop. S. Paulo,* 56(1), 35-41.

Bhatta, B.R., Kaphle, K., & Yadav, K.K. (2018). Situation of Livestock, Production and its Products in Nepal. *Archives of Veterinary Science and Medicine,*1 (1), 001-008.

Bhutto, B., Arijo,A., Phullan, M.S., & Rind, R.(2012). Prevalence of fasciolosis in buffaloes under different agro-climatic areas of Sindh Province of Pakistan. *International Journal of Agriculture and Biology*, 14, 241–245.

Bista, S., Lamichhane, U., Singh, D.K., & Regmi, S. (2018). Overview of seasonal prevalence of liver fluke & rumen fluke infestation in cattle and buffalo of western Chitwan, Nepal. *Journal of Institute of Agriculture and Animal Science*, 35, 25-241.

Boray, J.C. (1982). Chemotherapy of Fasciolosis. *New South Wales Vet. Proc*., 8, 42-47.

Choubisa, S.L., & Jaroli, V.J. (2013). Gastrointestinal parasitic infection in diverse species of domestic ruminants inhabiting tribal rural areas of southern Rajasthan, India. *J. Parasit. Dis.,*37(2), 271-275.

Daniel, W.W. (1999). *Biostatistics: A Foundation for Analysis in the Health Sciences*. 7th ed. New York: Wiley.

Dhakal, I.P., & Nepali, D.B. (1984). Incidence of Liverfluke in cattle and Buffaloes at livestock Farm of IAAS. *Journal of Institute of Agriculture and Animal Science,* 4(1&2), 15-17.

Esteban, J.G., Muñoz-Antoli, C., Toledo, R., & Ash, L.R. (2014). Diagnosis of Human Trematode Infections. In: Toledo R., Fried B. (eds) Digenetic Trematodes. *Advances in Experimental Medicine and Biology*, 766, Springer, New York, NY

Gonzalez–Lanza, C., Manga–Gonzalez, Y., Del–Pozo–Carnero, P., & Hidalgo–Arguello, R. (1989). Dynamics of elimination of the eggs of *Fasciola hepatica* (trematoda, digenea) inthe faeces of cattle in the Porma Basin, Spain. *Vet. Parasitol.,* 34, 35–43.

Gupta, S.C., & Singh, B.P. (2002). Fasciolosis in cattle and buffaloes in India. *Journal of Veterinary Parasitology,*16(2),139-145.

Howlader, B.C., Rahman, M.M., Alam, K.J., Moonmoon, M., & Howlader, R. (2017). Study on Prevalence of Bovine Fasciolosis at Mirzaganj Upazilla of Patuakhali District in Bangladesh. *International journal of Innovative Research*, 2(1), 9-12.

Humbal, M., Ayuni, R., Vanda, H., Amiruddin, A., & Athaillah, F. (2020). Occurrence of *Fasciola* gigantica and Paramphistomum spp Infection in Aceh Cattle. *E3S Web of Conferences,* 151, 01025. 1st ICVAES 2019.

Iboyi, M.O., Agada, P.A., & Imandeh, N.G. (2017). Study on the prevalence of fasciolosis on cattle slaughtered at Minna Modern abattoir, Niger state, Nigeria. *J. Appl. Life Sci. Int*., 15(3),1–6.

Isah, U. M. (2019). Studies on the prevalence of fasciolosis among ruminant animals in northern Bauchi state, north-eastern Nigeria. *Parasite epidemiology and control*, *5*, e00090. doi: 10.1016/j.parepi.2019.e00090

Islam, K.M., Islam, M.S., Adhikary, G.N., Hossain, K.M.M., Rauf, S.M.A., & Rahman, M. (2016). Epidemiological studies of fasciolosis (*Fasciola* gigantica infection) in cattle. *J. Adv. Parasitol*., 3(1), 10-13.

Japa, O., Siriwechviriya, P., & Prakhammin, K. (2020). Occurrence of fluke infection in beef cattle around Phayao Lake, Phayao, Thailand, *Veterinary World*, 13(2), 334-337.

Joshi, D.D., & Tiwari, H.C. (1975). Some observations on incidence of fasciolosis in yak and hilly cattle. *Bulletin of Veterinary Science and Animal Husbandry*, Nepal, 4, 1-3.

Karim, M.R., Mahmud, M.S., & Giasuddin, M. (2015). Epidemiological study of bovine fasciolosis: prevalence and risk factor assessment at Shahjadpur Upazila of Bangladesh. *Immunology and Infectious Disease,* 3(3); 25-29. DOI: 10.13189/iid.2015.030301

Khan, S.A. (2017). Study on the Prevalence and Gross Pathology of Liver Fluke Infestation in Sheep in and Around Quetta District, Pakistan. *Advances in Animal and Veterinary Sciences*, 3(3), 151–155.

Mahato, S.N., & Harrison, L.J.S. (2005). Control of fasciolosis in stall-fed buffaloes by managing the feeding of rice straw. *Trop. Anim. Heal. Prod*., 37, 285–291.

Mahato, S.N., Harrison, L.J.S., & Hammond, J.A. (2000). Overview of Fasciolosis-an economically important disease of livestock in Nepal Fasciolosis 2000 - Nepal Strategies for feed management in areas endemic for Fasciolosis. Retrieved from: https://pdfs.semanticscholar.org/9a49/a8405f9fc0b7e3a9e5d431d459f83362874a.pdf

Mas-Coma, S., Bargues, M.D., & Valero, M.A. (2005). Fasciolosis and other plant-borne trematode zoonoses. *International Journal for Parasitology*, 35(11-12), 1255–1278.

Nath, T.C., Islam, K.M., IIyas, N., Chowdhary, S.K., & Bhuiyan, U. (2016). Assessment of prevalence of gastrointestinal parasitic infections of cattle in hilly areas of Bangladesh. *World Scientifc News*., 59, 74-84.

Naing, L., Winn, T., & Rusli, B.N. (2006). Practical issues in calculating the sample size for prevalence studies. *Arch Orofac Sci.*, 1, 9–14.

Ross, J.G., Dow, C., & Todd, J.R,. (1967). The pathology of *Fasciola hepatica* infection in pigs: A comparison of the infection in pigs and other hosts. *Brit. Vet. J.,* 123, 317-322.

Sardar, S.A., Ehsan, M.A., Anower, A.K.M.M., Rahman, M.M., & Islam, M.A. (2006). Incidence of liver flukes and gastrointestinal parasite in cattle. *Bangladesh Journal of Veterinary Medicine*, 4(1).

Sha, R.P., Prasai, H.K., Shrestha, J., Talukder, M.H., Rahman, A.A., & Sah, R.B. (2018). Seasonal and altitudinal prevalence of fasciolosis in buffalo in eastern Nepal. *Journal of Nepal Agriculture Research Council*, 4,48-53.

Siddiki, A.Z., Uddin, M.B., Hasan, M.B., Hossain, M.F., Rahman, M.M., Das, B.C., Sarker, M.S., & Hossain, M.A. (2010). Coproscopic and haematological approaches to determine the prevalence ofhelminthiasis and protozoan diseases of Red Chittagong Cattle (RCC) breed in Bangladesh. *Pak. Vet. J.,* 30(1), 1-6.

Singh, N.B., Basnyat, B.M., Eichenberger, G., & Bommeli, W. (1973). Report on Preparatory phase of Parasite Control Project. HMG/SATA, Kathmandu, Nepal.

Simbwa, G., Baluka, S. A., & Ocaido, M.(2014). Prevalence and financial losses associated with bovine fasciolosis at Lyantonde Town abattoir. *Livestock Research for Rural Development,*26(165).

Soulsby, E.J.L. (1986). *Helminths, Arthropods and Protozoa of Domesticated Animals*, 7th ed. Te ELBS and Bailliers, Tindle, Cassell, London, 763-766.

Swarnakar G., & Sanger B. (2014). Epidemiological study of liver fluke (Trematoda: Digenea) in Domestic Ruminants of Udaipur District. *International Journal of Current Microbiology and Applied Science*. 3(4): 632-640.

Tolan R.W. (2011). Fasciolosis Due to *Fasciola hepatica* and *Fasciola gigantica* Infection: An Update on This 'Neglected' Neglected Tropical Disease, *Laboratory Medicine*. 42 (2); 107–116.

Winkler J. (1982). Prevalence of helminths in sheep and goats. *Aust. Vet. J.* 12: 14-18.

Yadav S.K., Ahaduzzaman, M., Sarker, S., Sayeed, M.A., & Hoque, M.A. (2015). Epidemiological survey of fasciolosis in cattle, buffalo and goat in Mahottari and Dhanusha, Nepal. *The journal of advances in parasitology* 2(3): 51-56.