Research Article

Prevalence of Fasciolosis in Cattle Farm of Tilottama Municipality, Rupandehi, Nepal

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Abstract | Fasciolosis is a common parasitic disease affecting cattle and other ruminants, commonly sheep, and caused by *Fasciola hepatica* and *F. gigantica*. The disease is cosmopolitan in distribution and can cause extensive economic losses to the farmers. 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, stage, and breeds for examination (sedimentation method) to visualize eggs of *Fasciola* microscopically. The obtained data were coded and analysed using Microsoft Excel 2016. The overall prevalence of fasciolosis in cattle was found to be 15.56%. Age and sex-wise prevalence was found to be statistically significant (P<0.05), while stage and breed-wise prevalence was insignificant (P>0.05). Fasciolosis is prevalent moderately among cattle in Tillottoma municipality, which necessitates the study of detailed epidemiology of the disease and effective control strategies to prevent huge economic losses.

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Introduction

Cattle is the most important livestock in Nepalese society for milk and manure and possess religious importance (Bhatta *et al*., 2018), and parasitic infestation in cattle causes significant economic loss to the Nepalese farmers (Yadav *et al*., 2015). Among the parasitic infestation, fasciolosis is the most widespread parasitic disease in the world, affecting cattle and other ruminants (Boray, 1981; Gonzalez *et al*., 1989) and has a significant financial loss due to decreased in cattle production (Choubisa and Jaroli, 2013). According to Mas-Coma *et al*. (2005), 300 million bovines are exposed to fasciolosis worldwide, with prevalence more significant than 30%. In Nepal, Lohani and Rasaili (1995) estimated an annual loss

of US$ 14.2 crore to the country's national economy due to Fasciolosis. The disease is caused by digenetic trematode of genus *Fasciola*, which inhabits the bile duct, commonly known as liver fluke (Soulsby, 1986). *Fasciola hepatica* and *F. gigantica* are the main species that infect cattle, which first predominate in temperate regions 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, 1986). 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, decreased rectal temperature and ruminal motility, reduced serum copper, iron, magnesium, increased heart and respiration rates, which can be controlled by treatment, however, if left untreated for prolonged period, leads to serious condition (Gupta and Singh, 2002). Several methods are available for diagnosing fasciolosis through immunological and molecular techniques; however, the detection of eggs by faecal examination technique is taken as the gold standard (Esteban *et al*., 2014).

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

Materials and Methods

Study area, sample size and sampling

The study was conducted in Tilottama Municipality, Rupandehi district which lies in Lumbini Province of Nepal. This area lies on the south-western part of Nepal an altitude between 1000 to 1229 ft. from sea level and experiences tropical climatic conditions exceeding 40°C in summer. The district has a total area of 1,360 km^2, with 16.1% in Churia Range and rest in the plain Terai region.

The sample size was calculated according to Daniel's formula: N = Z2 P (1-P) /d2 (Daniel, 1999). The expected prevalence (P) of 50% was used with an 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 the 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 time constrain.

Purposive sampling was done followed by analysis starting from July, 2019 to September, 2019 (3 months). A total of 270 faecal samples along with individual animal data were collected from the commercial cattle farm of Tilottama municipality based 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 of 8 AM – 1 PM, which were kept in plastic zipper bag.

Sample analysis

For laboratory analysis of the faecal samples, simple sedimentation technique was used as described by Soulsby (1986): 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, and water was added and sedimented until 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 the microscope in 10X magnification.

Table 1: *Age wise prevalence.*

	Under 1 year	1 to 2 years	2 to 3 years	3 to 4 years	Above 4 years	Total	P value
Sample taken	26	24	52	42	126	270	0.043
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	

Table 2: *Sex wise prevalence.*

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

Table 3: *Stage wise prevalence.*

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

Table 4: *Breed wise prevalence.*

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

For statistical analysis, data obtained were coded and analyzed in MS-EXCEL 2016. Overall prevalence of fasciolosis along with variations based on 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 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 by Yadav *et al.* (2015), who found a 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 animal husbandry and environmental conditions. In this study, the population is absolutely from commercial cattle farms where they were stall-fed and deprived of free ranged grazing practice. In support, the prevalence is notably lower in tethered compared to the free, range which may be due to less exposure with contact to the risk factors such as metacercaria in the grazing land (Yadav *et al.*, 2015). However, this result was similar to that of Islam *et al.* (2016), who found overall prevalence of 18.64% in cattle Sylhet division of Bangladesh. Certain risk factors such as previous infections, contaminated feed, etc. may be involved in the presence of *Fasciola* infection in farms in which the animals were not grazed. 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, 1967). Other routes of infection such as metacercariae-contaminated water, freshly cut grass, and hay are also possible (Boray, 1982).

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

Age-wise prevalence

This result shows a significantly higher prevalence (P<0.05) in 1-2year old (33.33%) which is supported by Howlader *et al.* (2017) as well as by Alemnen and Ayelign (2017), which shows a higher prevalence in 1-5 years old. Higher infestation of parasites in the young can be due the inadequate immunity against the parasite. In support, young animals are more susceptible to parasitic infestation than adult (Khan, 2017). On the other hand, adult animals might have developed immunity against 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 *et al.* (2015), Isah (2019), and Bhutto *et al.* (2012) which shows a higher prevalence of fasciolosis in older than younger cattle. Other studies show prevalence of 68.08% in old and 55.62% in adult (Ayele *et al.*, 2018). Similarly, Simbwa *et al.* (2014) found 44.8% in adults and 31.8% in sub adults and Japa *et al.* (2020) found more in > 4 years old (17.1%) and low in 2-4 year old (5.6%).

Sex-wise prevalence

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 *et al.* (2020) and Isah (2019), whereas contradicted with Ayele *et al.* (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 this 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).

Stage-wise prevalence

From this 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 the result contradicted 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 direct source of income for the farmers, which ultimately resulted to lower prevalence as compared to heifers and calves.

Breed-wise prevalence

Higher prevalence of fasciolosis was found in improved/cross breeds (15.75%) than local breeds (12.5%). This result is supported by Simbwa *et al.* (2014) who found 54.8% in exotic and 25.5% in local and contradicted by Japa *et al.* (2020) who found more incidences in local (9.6%) than in cross breed (5.3%). However, in this 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.

Conclusions and Recommendations

The outcome of this 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 the disease which cause huge economic loss.

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Author's Contribution

NB and AC presented the idea. Sample collected by NB. Sample examination was done by NB, SS and BRB. Research supervision was done by AC. All authors discussed and contributed to the final manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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