



Epidemiological Assessment of Bovine Fascioliasis and the Efficacy of Anthelmintic Drugs in Cattle in Southern Bangladesh

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ABSTRACT

Bovine fascioliasis is considered to be an economically important parasitic disease of cattle in Bangladesh. This study investigated its occurrence, related risk factors, and the efficiency of frequently used anthelmintic medications. The study was conducted from 11th July, 2024 to 15th January, 2025 in and around Dighalia Upazila, Khulna in Bangladesh. A total of 379 fecal samples were collected from the indigenous (*Bos indicus*) and crossbred cattle and tested by using the standard direct smear method at the Upazila Veterinary Hospital laboratory in Dighalia, Khulna. The overall prevalence was found to be 59.9% from 227 positive samples. Feeding practice, body condition, season, deworming history and types of anthelmintic drugs were found to have a significant association with fascioliasis ($P < 0.001$). In contrast, when considering the relationship with sex, age and genotypes, it was observed that there was no significant association ($P > 0.05$). Animals of poor body condition had a prevalence rate of 81.82%, followed by moderate (55.00%) and good (45.76%) body conditions. The study also showed that deworming significantly reduced the infection rates (40.00%) compared to non-dewormed cattle (72.93%). Furthermore, pasture-fed cattle had a higher prevalence rate (70.0%) compared to stall-fed (48.60%). Higher prevalence was observed in monsoon (76.00%), followed by late monsoon (62.12%) and winter seasons (40.98%). Drug efficacy varied. Triclabendazole was most effective (96.00%), followed by Nitroxynil (87.72%), Albendazole (66.67%), Fenbendazole (62.50%), and Levamisole (57.14%). This study highlights the vital necessity for effective management practices, including systematic deworming, enhanced feeding strategies, and the selective use of anthelmintic drugs to decrease veterinary expenses and control bovine fascioliasis in Bangladesh.

Keywords: Bangladesh, Deworming, Cattle, *Fasciola*, Risk Factors.

Original Article:

DOI: <https://doi.org/10.21608/javs.2025.432319.1794>

Received : 13 October, 2025.

Accepted: 01 December, 2025.

Published in January, 2026.

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J. Appl. Vet. Sci., 11(1): 31-39.

INTRODUCTION

Fascioliasis, caused by *Fasciola* spp., is a tropical disease that is transmitted by food and water. It affects both animals and humans worldwide, predominantly in tropical and subtropical regions (Mehmood *et al.*, 2017). *Fasciola*, commonly referred to as liver fluke, causes widespread morbidity and mortality in cattle, goats and sheep. It is characterized by anemia and hypoproteinemia, as well as high anthelmintic costs (Islam *et al.*, 2016). Fascioliasis is also regarded as a significant and catastrophic disease globally, including in Bangladesh. It causes substantial economic losses, reduced weight gain (up to 20%), diminished milk and meat production (3–15%), and

damage and condemnation of the liver in infected livestock (Mohanta *et al.*, 2014; Khan *et al.*, 2017; Opio *et al.*, 2021). The occurrence of fascioliasis has increased worldwide during the last two decades, possibly attributable to alterations in animal husbandry practices, climatic changes, and the rise of anthelmintic resistance (Sabourin *et al.*, 2018).

The two main species are *Fasciola gigantica*, which is found considerably in the tropics and subtropics, and *Fasciola hepatica*, found in temperate zones (Legesse and Gameda, 2015). Livestock consuming snail-infected water from watering places and grazing wetlands are connected to infestation with the freshwater snail through oral route and large tropical

regions of Africa, India, Pakistan and Bangladesh are the primary endemic zones for *F. gigantica* (Karim et al., 2015).

In Bangladesh, fascioliasis is considered an important parasitic disease of livestock (Khan et al., 2017). Dighalia Upazila, located in the Khulna District of Bangladesh, has some significant environmental characteristics, with low-lying, marshy areas that are favorable for the intermediate host snail (*Lymnaea auricularia*). The presence of wetlands, irrigation practices, and warm and humid climate conditions facilitate the survival and multiplication of both the parasite and its snail host which is necessary for the transmission of fascioliasis (Legesse and Gameda, 2015).

For effective parasitic prevention and control programs, a complete epidemiological study is considered as the foundation (Soliman, 2008). In ruminants, fascioliasis has a close association to season, moisture, grazing land and the body condition of the animal (Mia et al., 2021). Due to the lack of commercially accessible vaccinations, anthelmintic medications are the primary treatment for fascioliasis (Davis et al., 2020). Triclabendazole (TCBZ), Nitroxinil (NTON), Oxyclozanide (OCZN), Clorsulon (CLORS), Closantel, and Albendazole (ALBZ) are the most frequently used anthelmintic medicines to treat fascioliasis in animals (Kelley et al., 2016). Because it works against both immature and mature flukes, TCBZ is the primary choice for treating fascioliasis (Rolfe and Boray, 1987).

There is no published report on the prevalence of bovine fascioliasis in Dighalia Upazila, Khulna, Bangladesh. Besides this, no control strategy is followed by the farmers of the studied area. Treatment is generally given based on signs and symptoms such as diarrhea, edema of submandibular regions, and anorexia. Treatment failures are frequently reported, as there is no study on the efficacy of anthelmintic drugs that are commonly used in the field. A huge number of snails are found in this low-lying marshy land. Other factors contributing to higher infection rates include grazing practices, soil texture, and traditional animal husbandry, with animals that graze in contaminated pastures being more susceptible. Considering the economic importance and pathological condition of bovine fascioliasis, the objectives of this study were:

- i. To assess the prevalence and risk factors of bovine fascioliasis in the population of cattle in Dighalia Upazila, Khulna, Bangladesh.
- ii. To evaluate the efficacy of commonly used anthelmintic drugs to prevent and control of fascioliasis in field conditions.

MATERIALS AND METHODS

Study area

The study was carried out in and around Dighalia Upazila, Khulna district, Bangladesh (22°52'N, 89°32'E), covering an area of 86.52 km². The average temperature in the studied area ranged from 11°C to 41°C with an annual rainfall of 1244.3 mm. This region is predominantly pertinent for fascioliasis due to its low-lying swampy land, wetlands, and irrigation application, which offer favorable surroundings for the intermediate host snail (*Lymnaea auricularia*). Fecal investigations were completed at the Upazila Livestock Office and Veterinary Hospital, Daulatpur, Dighalia, Khulna.

Study population and their sources

Fecal samples were collected from cattle existing to the Upazila Veterinary Hospital, Dighalia, Khulna for regular diagnosis and treatment. Both indigenous (*Bos indicus*) and crossbred cattle were comprised in the study.

Ethical statement

Animal welfare was taken into consideration throughout the study. No unnecessary pain was imposed to the experimental animals. On the other hand, farmers were informed about the objective the study, and oral permission was attained before sample collection. All the measures were taken in agreement with the rules for animal safety.

Study design

A cross-sectional study was conducted using simple random sampling. Information on age, sex, genotype, season, feeding practices (pasture vs. stall feeding), and deworming history was recorded at the time of sampling through questionnaires administered to farmers. Physical examinations were also done and carefully maintained the standard protocols. The diagnosis was made on the basis of history, owner complaints, clinical and presenting signs, and findings of clinical examinations. Furthermore, fecal samples examination was performed to confirm parasitic cases, and the results were recorded in a data sheet. The animals were divided into three groups: young (< 3 years), adult (3-5 years), and old (> 5 years of age). Considering the meteorological conditions, the study period was divided into three seasonal periods: monsoon (July-August), late monsoon (September-October), and winter (November- January).

Prevalence rate

Prevalence rate was calculated by the following formula described by (Martin et al., 1987):

$$\text{Prevalence rate (\%)} = \frac{\text{No. of cattle with fasciolosis}}{\text{Total number of cattle at risk}} \times 100$$

Collection of fecal samples

The study was conducted from 11 July 2024 to 15 January 2025 (27 weeks). Fecal samples (20-30g) were collected directly from the rectum or just after defecations. A plastic hand gloves was used for the collection of fecal samples. Fecal samples were kept in polyethylene bag (containing 10% formalin) immediately after collection with proper labeling. All the samples were examined using compound bright field light microscope using a 40 objective $\times 10$ eyepiece magnification with a 30 μm scale bar following standard direct smear method.

Coprological examination and diagnosis of fascioliasis

Clinical Diagnosis of fascioliasis

Following signs to fascioliasis infestation was taken consideration for tentative diagnosis. Acute cases characterized by frothy blood through nostrils and anus, dullness, weakness, lack of

appetite, reddishness and edema of mucous membrane. Chronic cases showed anemic condition with rough and dry hair, weakness, pale mucous membrane, bottle jaw, shiny colored feces.

Laboratory examination

Confirmatory diagnosis was performed by standard direct smear and simple sedimentation method. A drop of water was placed on the center of a clean glass slide. Then a small amount of feces was taken from the sample and spread it out to form a thin smear. Coarse particles were removed, and a cover slip was applied. The slide was examined under a compound bright field light microscope using a 10x and 40x objective lens. Eggs of *Fasciola* spp. were recognized through their typical yellowish-brown operculated appearance, thin shell, and biliary color staining (**Fig. 1**).

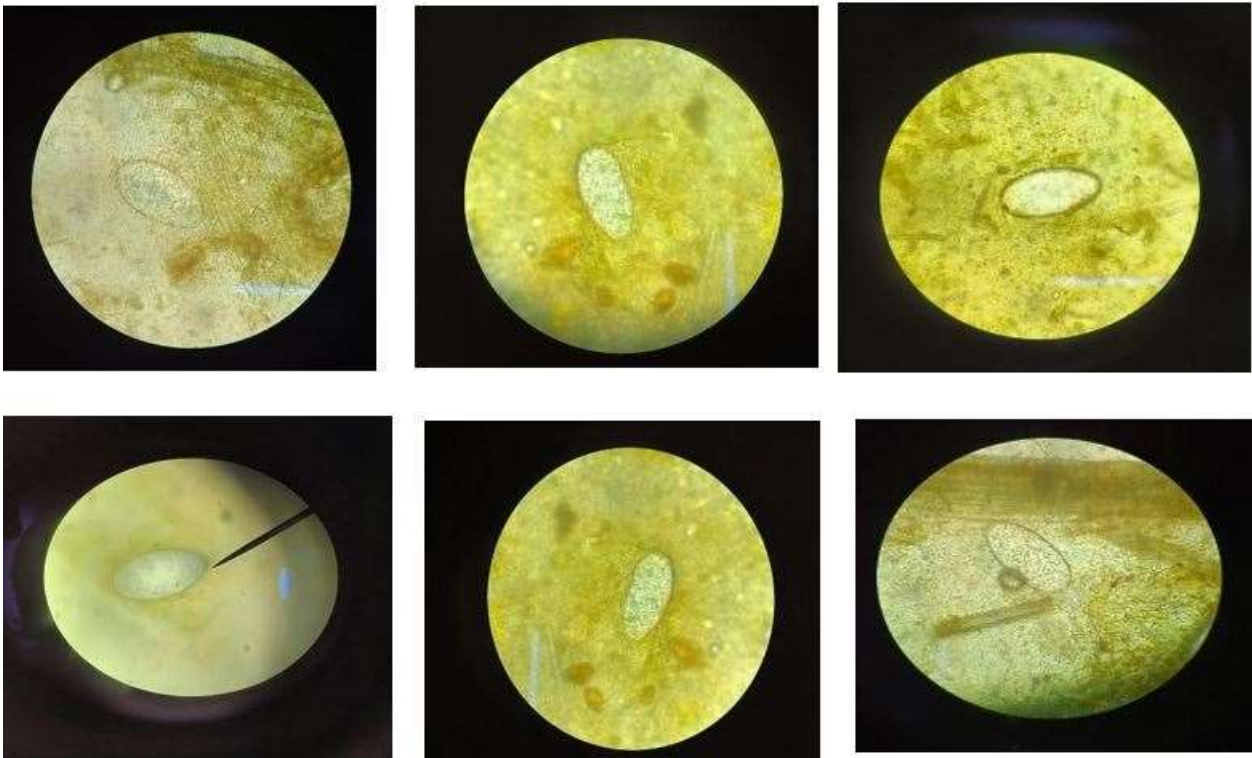


Fig. 1: Eggs of *Fasciola* spp. observed under compound bright field light microscope using a 40 objective $\times 10$ eyepiece magnification with a 30 μm scale bar.

Evaluation of the efficacy of anthelmintic drugs

Efficacy was assessed by the proportion of animals testing negative for *Fasciola* eggs 21 days post-treatment (after completion of two doses). Fecal samples were re-examined using the same smear method, and field observations from farmers were also considered. A baseline comparison was completed with pre-treatment infection status. Anthelmintic drugs commonly used for the treatment of fascioliasis are presented in **Table 1**.

Table 1: Anthelmintic drugs used for the treatment of fascioliasis.

Generic name	Trade Name	Manufacturer	Route of administration	Recommended Dose (Cattle)
Albendazole	Aldazole (Bolus)	Techno Drugs Ltd.	Oral	10 mg kg Bwt. ⁻¹
Levamisole	Levavet (Bolus)	Square Pharmaceuticals Ltd.	Oral	8 mg kg Bwt. ⁻¹
Triclabendazole	Acinex vet (Bolus)	ACI Ltd.	Oral	12 mg kg Bwt. ⁻¹
Fenbendazole	Fenazolvet (Bolus)	ACME laboratories Ltd.	Oral	7.5 mg kg Bwt. ⁻¹
Nitroxynil	Nitronex (Injection)	ACME laboratories Ltd.	SC	10 mg kg Bwt. ⁻¹

Bwt. = body weight; SC = sub-cutaneous

Statistical analysis

Data were analyzed using Microsoft Excel 2021 and SPSS (Version 25) program. Descriptive statistics were done to analyze the frequency and percentage of *Fasciola* infection among different risk factors such as deworming status, body condition, sex, age groups, seasons and feeding practices. Relations among *fascioliasis* and categorical variables were tested using chi-square analysis, with significance set at $P < 0.05$.

RESULTS

Overall prevalence

The study was conducted among 379 cattle population taken from Dighalia Upazila, Khulna, Bangladesh. Of these, 227 (59.9%) were *Fasciola* positive and 152 (40.1%) were negative (**Fig. 2**).

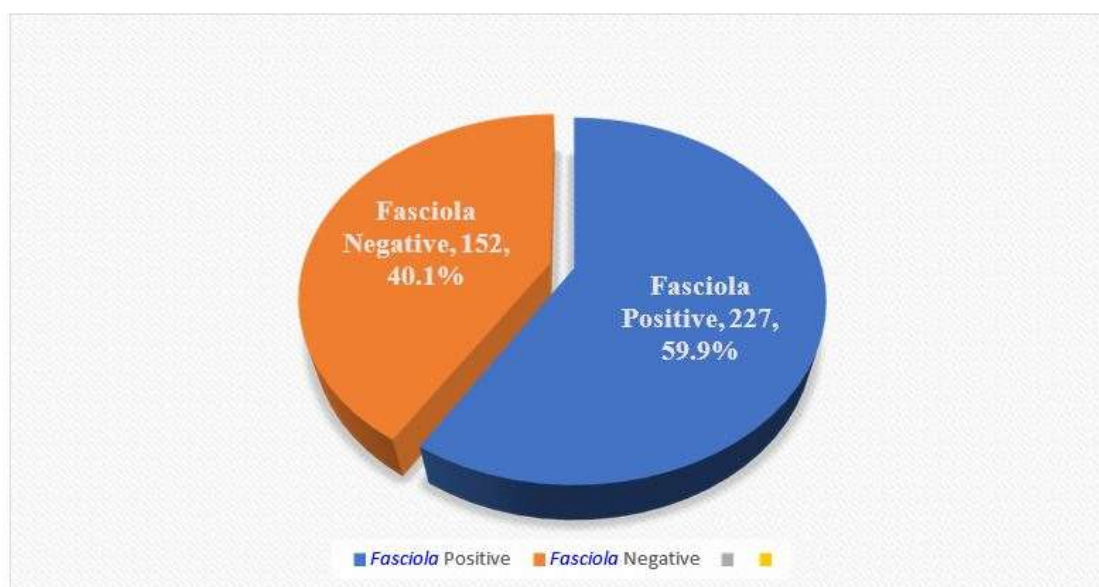


Fig. 2: Overall prevalence of *Fasciola*

Risk factors of fascioliasis and its effects on the prevalence

Prevalence according to the age of animals

Young (<3 years) age group of animals showed the highest prevalence rate of fascioliasis (65.38%), while old age group demonstrates the lowest (53.16%) (**Table 2**). The adult group had the moderate prevalence rate of 58.82%. The variation in prevalence among animal's age group was not significant ($P > 0.05$).

Prevalence according to the sex of animals

In male group, 103 were positive out of 173 samples and the prevalence rate was 59.54% (Table 2). On the other hand, in female group 124 were positive out of 206 samples (60.19%). The differences in prevalence of fascioliasis between sex groups was not significant ($P>0.05$).

Table 2: Prevalence of fascioliasis according to the sex and age groups of animals.

Prevalence	Sex		Age groups		
	Male	Female	Young (< 3 years)	Adult (3-5 years)	Old (> 5 years)
Fascioliasis positive	103	124	85	100	42
Total samples	173	206	130	170	79
Prevalence (%)	59.54	60.19	65.38	58.82	53.16
<i>P</i> -value	0.9803		0.2017		

P-values were obtained using the Chi-square test to assess differences between groups.

Prevalence according to the genotypes of animals

Data of the Table 3 shows that the crossbred cattle had a higher prevalence rate ($P>0.05$) of fascioliasis at 62.07% compared to 52.81% in indigenous cattle (*Bos indicus*).

Prevalence according to the feeding practices of animals

Results revealed a strong relation between feeding practices and the fascioliasis infestation in cattle. The infection rate was markedly higher among pasture fed animals (70.00%) compared to 48.60% in stall fed animals ($P<0.001$) (Table 3).

Table 3: Prevalence of fascioliasis according to the genotypes and feeding practices of animals.

Prevalence	Genotypes		Feeding practices	
	Crossbreed (<i>Bos taurus</i> × <i>Bos indicus</i>)	Indigenous (<i>Bos indicus</i>)	Pasture feeding	Stall feeding
Fascioliasis positive	180	47	140	87
Total samples	290	89	200	179
Prevalence (%)	62.07%	52.81%	70.00%	48.60%
<i>P</i> -value	0.1511		<0.001	

Prevalence (%) was calculated as the number of fascioliasis-positive animals divided by the total examined in each category; *P*-values were obtained using the Chi-square test.

Prevalence according to the seasons

Data presented in Fig. 3 illustrates a significant seasonal variation in the prevalence of fascioliasis among the cattle population of Dighalia Upazila ($P<0.001$). During the monsoon season, the prevalence was markedly higher (76.00%) than the prevalence rate of late monsoon (62.12%) and winter season (40.98%) (Fig. 3).

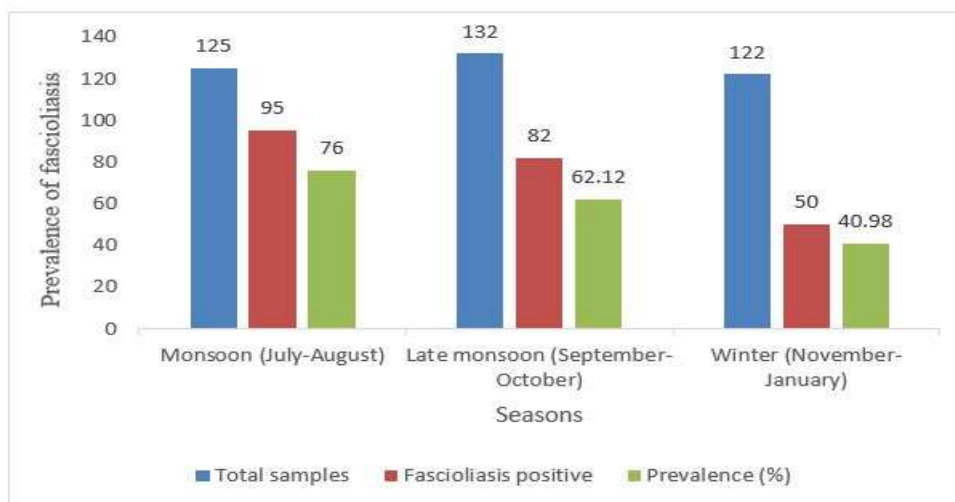


Fig. 3: Prevalence of fascioliasis according to the seasons.

Prevalence according to the body condition

Data of **Table 4** indicates a strong relationship between body condition and the prevalence of fascioliasis ($P < 0.001$). Those in poor health body condition exhibited higher prevalence rate (75.00%) while the animals of moderate body condition showed 55.00% of infection rate. On the contrary, animal with good body condition had the lowest infection rate (45.76%) compared to other two groups ($P < 0.001$).

Prevalence according to the deworming history

There was a significant relation between deworming history and the prevalence of fascioliasis in cattle ($P < 0.001$). The prevalence of fascioliasis in dewormed animals was 40.00%, where the rate was 72.93% in the animals without deworming (**Table 4**). Body condition was categorized as poor, moderate, or good based on physical assessment; P -values were obtained using the Chi-square test.

Table 4: Prevalence of fascioliasis according to the body condition and deworming history.

Prevalence	Body conditions			Deworming history	
	Poor	Moderate	Good	Dewormed	Not dewormed
Fascioliasis positive	90	110	27	60	167
Total samples	120	200	59	150	229
Prevalence (%)	75.00	55.00	45.76	40.00	72.93
P -value	<0.001			<0.001	

Efficacy of commonly used anthelmintic drugs against fascioliasis

The data (**Fig. 4**) shows the efficacy of anthelmintic drugs that were given for the treatment purpose against fascioliasis among 227 *Fasciola* positive cattle. Among the given drugs, Triclabendazole showed the highest efficacy rate (96.00%). Most of the farmers reported that there was a remarkable improvement within a week and the fecal egg counts dropped considerably while applied Triclabendazole. Nitroxynil holds the second highest efficacy rate of 87.72 % and there were positive feedbacks from the farmers while using this drug against fascioliasis. Other three drugs, Albendazole, Levamisole and Fenbendazole though used widely for their

affordability and availability, their efficacy rates were significantly lower which were 66.67%, 57.14% and 62.50%, respectively ($P < 0.001$).

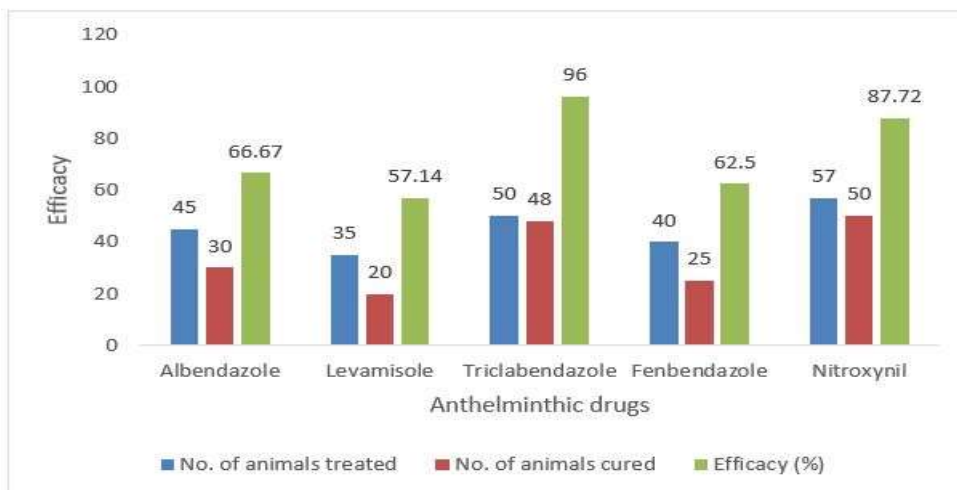


Fig. 4: Efficacy of anthelmintic drugs against fascioliasis

DISCUSSION

The overall prevalence of *Fasciola* spp. infestation in the present study was 59.9% among 379 fecal samples collected from cattle in Dighalia Upazila, Khulna. This high incidence specifies that fascioliasis remains a main parasitic load in the area, likely influenced by ecological situations favorable for the intermediate host (*Lymnaea* spp.). The results are consistent with earlier reports from Bangladesh (Karim *et al.*, 2015; Rahman *et al.*, 2017) and other countries such as India (Gupta and Singh, 2002) and Zambia (Nyirenda *et al.*, 2019). However, the occurrence was lesser than that stated in Ethiopia (Seid and Melese, 2018) and higher than studies from Pakistan (Rizwan *et al.*, 2022) and other Ethiopian regions (Alehegne and Bogale, 2013; Legesse and Gemed, 2015; Girma *et al.*, 2024). These differences may be attributed to variances in environment, management practices, diagnostic procedures, and accessibility of snail hosts.

In this study, the prevalence of fascioliasis across age groups was statistically non-significant ($P > 0.05$). The result reveals that the prevalence rate is higher in young cattle compared to other age groups. This trend is epidemiologically relevant and consistent with the study of Tesfaye *et al.*, (2025), who observed that several factors like lower immunity, first-time exposure, grazing habits and deworming gaps, may be the possible reasons for higher prevalence in young animals.

No significant difference was observed in fascioliasis prevalence between females (60.19%) and males (59.54%) ($P > 0.05$). However, other findings revealed remarkable differences in the prevalence rates between females (65.2%) and males (36.3%) in Zambia (Phiri *et al.*, 2005) and females (57.1%) and males (15.5%) by Zewde *et al.*, (2019) in Ethiopia. The lack

of statistical validation here indicates that sex may not be the main cause under local environments.

This study shows a higher prevalence rate of fascioliasis in crossbreed cattle (62.07%) compared to indigenous (*Bos indicus*) (52.81%), although the difference is not significant ($P > 0.05$). This trend aligns with reports that crossbreeds are likely more susceptible (52.83%) due to their lower immunity and lower adaptation to local conditions (Roka and Singh, 2024). The results suggest that strategic interventions like improved veterinary care and management practices may help mitigate the infection in crossbreed cattle.

Feeding practices showed a highly significant association ($P < 0.001$) with the prevalence of fascioliasis in cattle. Pasture-fed animals had a markedly higher frequency (70.00%) compared to stall-fed cattle (48.60%). It is aligned with the study conducted by Tesfaye *et al.*, (2025) and noted that the prevalence rate is high due to the ecology of *Fasciola* spp. and its intermediate hosts (snails) that thrive in wet pasture conditions.

This study illustrates a seasonal variation in the prevalence of fascioliasis among the cattle population of Dighalia Upazila ($P < 0.001$). Incidence peaked throughout the monsoon (76.00%), declined in the late monsoon (62.12%), and was lowest in winter (40.98%). These findings are in agreement with the ecology of *Fasciola* spp., which flourishes in moist, waterlogged environments that favor snail populations (Karim *et al.*, 2015).

This study indicates a clear inverse relationship between body condition and the prevalence of fascioliasis ($P < 0.001$). Cattle in poor body condition had the higher prevalence rate. This is likely due to weaker immunity and possibly chronic infection leading

to weight loss. It is supported by **Mpisana et al., (2022)** that poor body condition weakens the immunity and makes one more susceptible to parasitic infestation. They also suggested that improving herd nutrition and timely deworming can help reduce the infection rates.

The study represents a significant relation between deworming history and the prevalence of fascioliasis in cattle. The lower prevalence of fascioliasis among the dewormed animals compared to not dewormed animals ($P < 0.001$) indicates the deworming as a preventive measure. Similar studies by **Kurnianto et al., (2022)** confirmed the effectiveness of deworming in lowering the parasitic load in endemic areas and highlighted it as an essential for control strategies.

Regarding the drug efficiency, triclabendazole showed the highest cure rate (96.00%), followed by nitroxynil (87.72%). It aligns with the previous studies by **Kurnianto et al., (2022)**. Triclabendazole and Nitroxynil are very effective against both immature and mature flukes, which makes them suitable for control measures. In contrast, Albendazole, Levamisole, and Fenbendazole showed limited efficacy (57–67%), reflecting their low efficiency against *Fasciola* spp. This highlights the need for rational drug use, periodic efficacy monitoring, and ranking of triclabendazole and nitroxynil during high-risk seasons.

CONCLUSIONS

The results of the present study indicate that bovine fascioliasis is highly prevalent (59.9%) in the cattle in the studied area. Significant risk factors included feeding practices, the animal's body condition, deworming status and seasons, while age, sex, and genotype showed non-significant trends. Among commonly used anthelmintics, the efficacy of triclabendazole and nitroxynil was the highest. These findings emphasize the urgent need for integrated control measures, including regular deworming programs, improved feeding and nutrition, and the use of effective drugs, particularly during the monsoon season.

Acknowledgements

The authors sincerely thank the Upazila Livestock Office and Veterinary Hospital, Dighalia, Khulna, Bangladesh for providing access to facilities and assistance during data collection. We also acknowledge the cooperation of local farmers for allowing sampling from their animals.

Conflict of interest

The authors declare no conflict of interest regarding the publication of this manuscript.

Author contributions

MMI, EI, MHS, PR: conceptualization of the research, data collection, laboratory analysis, writing, and draft preparation; SSI: conceptualization, data analysis, writing and review.

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How to cite this article:

Md Moynul Islam, Efaaj Islam, Mahirul Haque Sheelong, Piyal Roy and Sarder Safiqul Islam, 2026. Epidemiological Assessment of Bovine Fascioliasis and the Efficacy of Anthelmintic Drugs in Cattle in Southern Bangladesh. *Journal of Applied Veterinary Sciences*, 11 (1): 31-39. <https://doi.org/10.21608/javs.2025.432319.1794>