



PREVALENCE OF BOVINE FASCIOLIASIS IN BAUCHI METROPOLIS ABATTOIR AND LIVESTOCK MARKETS IN BAUCHI STATE, NIGERIA

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ABSTRACT

The study determined the prevalence of bovine fascioliasis across three livestock markets: Kasuwan Shanu of Fadaman Mada, Railway and the Abattoir. A total of three hundred and ninety two (392) cattle faecal samples were collected and analyzed based on breed, age, and gender. The overall mean prevalence was 69.13%, with Kasuwan Shanu Railway recording the highest prevalence (75.00%), followed by Fadaman Mada (72.22%) and Abattoir (61.64%). Statistically significant differences in prevalence were observed between markets ($\chi^2 = 6.34$, $p < 0.05$). Breed-specific differences revealed higher infection rates in Sokoto Gudali cattle, particularly in Kasuwan Shanu Railway (85.71%), compared to White Fulani cattle (67.61%), with significant variation by location ($\chi^2 = 11.29$, $p < 0.05$). Age was a critical factor, as no infections were recorded in young cattle, while adult cattle showed significantly higher prevalence (73.17%–85.05%; $\chi^2 = 129.07$, $p < 0.05$). Males exhibited a higher prevalence (71.43%) than females (59.36%), confirmed by chi-square analysis ($\chi^2 = 16.15$, $p < 0.05$). There is need for targeted control measures, including regular deworming, proper grazing management, and clean water sources, alongside educational programs for farmers and stakeholders.

Keywords: Prevalence, Bovine, Disease, Faecal samples and Cattle

INTRODUCTION

Bovine fasciolosis, caused by *Fasciola hepatica* and *Fasciola gigantica*, is a globally significant parasitic disease of cattle, leading to liver damage, reduced productivity, and substantial economic losses in livestock (Temesgen & Mesfin, 2024). The disease involves a complex life cycle, with cattle as definitive hosts and freshwater snails (*Lymnaeidae*) as intermediate hosts. Transmission occurs through ingestion of metacercariae-contaminated vegetation or water, with risk factors including large grazing areas, mixed-species farming, and poor management practices (Che-Kamaruddin *et al.*, 2024). Prevalence rates vary widely due to climatic conditions and management practices, with reports of 3.73% in Nigeria, 19.75% in Cameroon, 32.20% in Nepal, and 49.21% in Ethiopia. Rainy seasons exacerbate transmission, as seen in Cameroon and Nigeria, where younger cattle (2–3 years) show higher susceptibility (Shinkafi *et al.*, 2024). Crossbred cattle are particularly vulnerable, with a prevalence of 58.6% in Peru (Diaz-Quevedo *et al.*, 2023). Economic losses are significant, including liver condemnation, reduced meat and milk production, and increased veterinary costs, with Nigeria alone reporting annual losses of \$26.02 million (Atanga *et al.*, 2024). Control measures, such as deworming, improved grazing practices and snail population management, are critical. Pharmacological treatments like triclabendazole and oxclozanide offer high efficacy, but challenges such as reinfection and emerging drug resistance persist (Rodríguez-Hidalgo *et al.*, 2024). This study assessed the prevalence of bovine fasciolosis in Bauchi metropolis abattoirs and markets, contributing to improved management and control strategies.

MATERIALS AND METHODS

Study Area

The study was conducted in Bauchi metropolis, Bauchi State, at three locations: Fadaman Mada, Kasuwan Shanu Railway, and the Abattoir. Kasuwan Shanu Railway is situated near the Bauchi railway station at approximately 10.29315°N latitude and 9.84910°E longitude. Bauchi State, located in northeastern Nigeria, covers approximately 49,119 square kilometers, accounting for about 5.3% of the country's total land area. It lies between latitudes 9°3' and 12°3' north and longitudes



8°50' and 11° east, sharing borders with Jigawa to the north, Taraba and Plateau to the south, Gombe and Yobe to the east, and Kaduna and Kano to the west (Musa et al., 2027). The state experiences a tropical savanna climate, with a rainy season from May to September, during which annual rainfall varies from about 700 millimeters in the north to 1,300 millimeters in the south. The dry season lasts from December to February, bringing harmattan winds from the Sahara and cooler temperatures, sometimes dropping to 12°C (53°F) at night. The hottest months, March and April, see daytime temperatures occasionally exceeding 40°C (104°F) (Musa *et al.*, 2027).

Sample and Sample Size Determination

Sample

A total of 392 samples were collected across three locations Fadaman Mada (126 samples), Kasuwan Shanu Railway (120 samples), and Abattoir (146 samples) and categorized by breed, age, and gender, consisting of two breeds (Sokoto Gudali: 56 samples, White Fulani: 336 samples), two age groups (young: 45 samples, adult: 347 samples), and two gender groups (male: 216 samples, female: 176 samples) for detailed analysis. Sample Size Determination and Sample collection procedure

The Cochran's sample size formula was used to calculate the samples.

$$n = \frac{Z^2 \cdot p \cdot (1 - p)}{E^2}$$

Z = Z-score corresponding to the desired confidence level (e.g., 1.96 for 95% confidence)

p = estimated proportion of the population

E = desired margin of error

It was described by **William** (1977)

Fecal samples were collected in a clean polythene bags from each cattle under hygienic conditions and immediately labeled with the location, breed, age, and gender of the animal. The samples were then transported to the laboratory for analysis.

Upon arrival at the study locations, fecal samples were obtained directly from the rectum of the animals. Each sample was properly labeled and stored in sterile clean polythene bag.

Samples Examination

Approximately 5 grams of feces were mixed with 200 milliliters of water in a 250-milliliter beaker to create a uniform suspension, which was then filtered through a tea strainer or double-layered cheesecloth into a second beaker to remove large debris; the filtrate was allowed to sit undisturbed for 30 minutes to enable the heavier *Fasciola* eggs to settle at the bottom, after which the clear supernatant was carefully decanted without disturbing the sediment; the sediment was re-suspended in 200 milliliters of water, thoroughly mixed, and the sedimentation process was repeated 3-5 times until the supernatant became clear, ensuring the removal of fecal debris; finally, the sediment was transferred to a Petri dish, stained with 1% methylene blue to enhance egg visibility, and examined under a dissecting microscope at 10× magnification to identify and count *Fasciola* eggs

Data Recording:

The results were systematically documented based on several parameters:

Location: Fadaman Mada, Kasuwan Shanu Railway, and Abattoir.

Breed: Sokoto Gudali and White Fulani.

Age Group: Young and Adult.

Gender: Male and Female.

Statistical Analysis

Data was analyzed using statistical software packages such as SPSS to evaluate the prevalence of Fascioliasis based on different factors. The statistical analysis was performed to determine associations between these factors and Fascioliasis prevalence. The data on Fascioliasis prevalence were recorded and grouped based on the location, breed, age, and gender of the animals. The prevalence of was calculated as the percentage of positive cases out of the total number of samples examined in each category. Chi-square tests were used to determine the statistical significance of differences in Fascioliasis prevalence across different locations, breeds, age groups,



and genders. A p-value of less than 0.05 was considered statistically significant. Descriptive statistics were used to summarize the number of positive cases and prevalence percentages in each group.

RESULTS AND DISCUSSION

Prevalence of *Bovine fascioliasis* Based on Locations/Market

The prevalence of bovine fascioliasis across the three markets is summarized in Table 1. Kasuwan Shanu Railway recorded the highest prevalence at 75.00% (90/120), followed by Fadaman Mada at 72.22% (91/126), while the Abattoir had the lowest prevalence at 61.64% (90/146). The overall prevalence across all locations was 69.13%. Chi-square analysis revealed a statistically significant difference in prevalence among the markets ($\chi^2 = 6.34$, $p < 0.05$), indicating that the variation was not random but likely influenced by factors such as management practices, grazing conditions, or exposure to intermediate hosts. This prevalence is substantially higher than the 16.50% reported by Kurnianto *et al.* (2022) in Boyolali, Indonesia (8.57%–33.96%), and the 25.4% observed by Mequaninit and Mengesha (2021) in Kombolcha Industrial Abattoir, Ethiopia (11.7%–33.8%). The differences may be attributed to variations in ecological conditions, cattle management practices, or diagnostic methods. Similarly, it is higher than the 8.20%–8.50% prevalence reported by Obialigwe *et al.* (2024) in Jalingo abattoir, Nigeria, and the 8.6%–26.5% observed by Olamilekan *et al.* (2023) in Akinyele, Ibadan, Nigeria, suggesting that factors such as seasonal sampling, grazing systems, or environmental exposures could influence the observed disparities. However, the prevalence in this study is comparable to the findings of Nkurunziza *et al.* (2024) in the Imbo Region, Burundi, where prevalence ranged from 30.7% to 74.3%, albeit with differences potentially arising from sampling locations and associated risk factors. Conversely, the observed prevalence is lower than the 82.61% reported by Opio *et al.* (2021) in Northern Uganda, where climatic and ecological conditions may exacerbate the burden of fascioliasis. Similarly, the prevalence is higher than the 19.23%–24.04% reported by Olaogun *et al.* (2024) in Oyo State, Nigeria, likely due to variations in diagnostic techniques and environmental conditions.

Table 1: Prevalence of *Bovine fascioliasis* Based on Locations/Market

Location/Market	No. of Samples N=392	Positive Cases (O ₁)	Negative Cases (O ₂)	Prevalence (%)
Fadaman Mada	126	91	35	72.22
Abattoir	146	90	56	61.64
Kasuwan Shanu Railway	120	90	30	75.00
Total	392	271	121	69.13

Chi-square statistic (χ^2) = 6.34

Critical value = 5.99 (at $\alpha=0.05$)

Degrees of freedom (df) = 2

Significance level (α) = 0.05

P-value = < 0.041

Prevalence of *Bovine fascioliasis* Based on Market Type and Breed

The prevalence of bovine fascioliasis varied significantly across breeds and locations, reflecting differences in susceptibility and exposure. In the Sokoto Gudali breed, prevalence rates were 44.44% in Fadaman Mada, 85.71% in Kasuwan Shanu Railway, and 70.83% in Abattoir, while the White Fulani breed exhibited prevalence rates of 75.00%, 67.61%, and 71.85% in the respective markets. Overall, the prevalence across all locations and breeds was 71.43%, with chi-square analysis ($\chi^2=11.29$, $p<0.05$) confirming statistically significant differences in prevalence across breeds and locations. The odds ratio (OR) analysis highlighted location-based differences in susceptibility. For instance, the Sokoto Gudali breed had lower odds of infection compared to the White Fulani in Fadaman Mada (OR=0.27), higher odds in Kasuwan Shanu Railway (OR=2.59), and nearly equal odds in Abattoir (OR=0.95). These variations suggest that breed-specific susceptibility is influenced by environmental and management factors. Comparative findings from previous studies further illustrate the variability in prevalence. Olaogun *et al.* (2024) reported prevalence rates of 22.03% for

Sokoto Gudali and 26.43% for White Fulani, while Obialigwe *et al.* (2024) documented lower prevalence rates of 7.94% and 9.09% for the respective breeds. Breeds like the Red Bororo and Kuri showed higher susceptibility in studies, with prevalence rates reaching 66.67% and 75.00%, respectively, as reported by Olaogun *et al.* (2024). These breed-specific differences align with global trends, such as those documented by Kouadio *et al.* (2020) in Côte d'Ivoire and Diaz-Quevedo *et al.* (2021) in Peru, where odds ratios underscored significant breed-based variation in fascioliasis prevalence.

Table 2: Prevalence of *Bovine fascioliasis* Based on Market Type and Breed

Location/ market	Breed	No. of Samples (N)	Positive Cases (O ₁)	Negative Cases (O ₂)	Prevalence (%)	Odds for Sokoto Gudali	Odds for White Fulani	Odds Ratio (OR)
Fadaman Mada	Sokoto	18	8	10	44.44	0.80	3.00	0.27
	Gudali							
	White Fulani	120	90	30	75.00	3.00	3.00	
Kasuwan Shanu	Sokoto	14	12	2	85.71	6.00	2.32	2.59
Railway	Gudali							
	White Fulani	113	79	34	67.61	2.32	2.32	
Abattoir	Sokoto	24	17	7	70.83	2.43	2.55	0.95
	Gudali							
	White Fulani	103	74	29	71.85	2.55	2.55	
Grand Total		392	280	112	71.43			

Chi-square statistic (χ^2) = 11.29

Critical value = 11.07 (at $\alpha=0.05$)

Degrees of freedom (df) = 5

Significance level (α) = 0.05

Q-value is < 0.047

Prevalence of *Bovine fascioliasis* Based on Market Type and Age

The study revealed significant differences in the prevalence of bovine fascioliasis across markets and age groups. Among young cattle (less than 2.5 years), no positive cases were recorded in any of the markets: Fadaman Mada (0/20), Kasuwan Shanu Railway (0/10), and Abattoir (0/15), resulting in a prevalence of 0%. In contrast, adult cattle exhibited a high prevalence, ranging from 73.17% in Abattoir (90/123) to 85.05% in Fadaman Mada (91/107). The overall prevalence across all markets was 69.13%, with statistically significant differences confirmed by chi-square analysis ($\chi^2 = 129.07$, $p < 0.05$). The absence of fascioliasis in young cattle aligns with findings from previous studies (Diaz-Quevedo *et al.*, 2021; Kurnianto *et al.*, 2022), which attribute lower exposure and potential resistance in younger animals to reduced grazing on contaminated pastures. Conversely, adult cattle's higher prevalence reflects prolonged exposure to environmental contamination and intermediate hosts, as noted in studies by Zewde *et al.* (2019) and Che-Kamaruddin *et al.* (2024). Market-specific differences also emerged, with the highest prevalence recorded in Fadaman Mada (85.05%), followed by Kasuwan Shanu Railway (76.92%) and Abattoir (73.17%). These variations likely stem from differences in grazing practices, water source contamination, and management strategies. Similar observations have been reported by Shinkafi *et al.* (2024) and Ahmad-Najib *et al.* (2021), emphasizing the role of environmental factors in fascioliasis distribution. The calculated odds ratio (OR) for young animals was 0.00 across all markets, reinforcing their negligible risk of infection. This finding corroborates previous research by Olaogun *et al.* (2024), which highlighted the critical influence of age on infection risk. Collectively, the study underscores the need for targeted interventions focusing on adult cattle and environmental management to mitigate fascioliasis prevalence.

Table 3: Prevalence of *Bovine fascioliasis* Based on Market Type and Age

Market	Age Group	No. of Samples (N)	Positive Cases (O ₁)	Negative Cases (O ₂)	Prevalence (%)	Odds for Young	Odds for Adult	Odds Ratio (OR)
Fadaman	Young	20	0	20	0.00	0.00	5.69	0.00
Mada	Adult	107	91	16	85.05	5.69	5.69	
Kasuwan	Young	10	0	10	0.00	0.00	3.33	0.00
Shanu	Adult	117	90	27	76.92	3.33	3.33	
Railway								
Abattoir	Young	15	0	15	0.00	0.00	2.73	0.00
	Adult	123	90	33	73.17	2.73	2.73	
Grand Total		392	271	121	69.13			

Chi-square statistic (X^2) = 129.07

Degrees of freedom (df) = 5

Critical value (for $\alpha=0.05$) = 11.076

P-value = < 0.001

PREVALENCE OF *BOVINE FASCIOLIASIS* BASED ON MARKET TYPE AND GENDER

The prevalence of bovine fascioliasis varied significantly across markets and genders. Among males, Fadaman Mada recorded a prevalence of 76.00%, Kasuwan Shanu Railway 63.64%, and Abattoir 77.55%. For females, the prevalence was 61.04%, 62.50%, and 51.85% in Fadaman Mada, Kasuwan Shanu Railway, and Abattoir, respectively. Overall, males showed a significantly higher prevalence (71.43%) than females (59.36%), as confirmed by chi-square analysis ($\chi^2=16.15$, $p<0.05$), highlighting a statistically significant difference in prevalence based on gender and market type. The odds ratio (OR) values further elucidate this gender-based disparity. In Fadaman Mada, males had twice the odds of testing positive for fascioliasis compared to females (OR=2.02). In Kasuwan Shanu Railway, the OR was 1.05, indicating a minimal advantage for males, while in Abattoir, males were three times more likely to be infected than females (OR=3.19). These findings align with studies such as Zewde *et al.* (2019), who reported a higher prevalence of fascioliasis in males, with an OR of 4.9 ($p<0.001$). Similarly, Olaogun *et al.* (2024) and Che-Kamaruddin *et al.* (2024) noted a higher prevalence in males, further supporting the trend observed in this study. The results may be attributed to behavioral and physiological differences between male and female cattle, as well as exposure patterns. Male cattle are often used for labor or transported across regions, increasing their exposure to *Fasciola*-infested pastures. These findings are consistent with those of Ahmad-Najib *et al.* (2021), who reported an OR of 3.104 for males, and Diaz-Quevedo *et al.* (2021), who noted that male cattle had a significantly higher likelihood of infection (OR=1.71). The observed prevalence differences across market types reflect variations in management practices, environmental conditions, and exposure to intermediate hosts. The significant chi-square value ($\chi^2=16.15$, $p<0.05$) confirms that the variation in prevalence across genders and markets is unlikely due to chance.

Table 4: Prevalence of *Bovine fascioliasis* Based on Market Type and Gender

Market	Gender	No. of Samples	Positive Cases (O ₁)	Negative Cases (O ₂)	Prevalence (%)	Odds for Male	Odds for Female	Odds Ratio (OR)
Fadaman Mada	Male	50	38	12	76.00	3.17	1.57	2.02
	Female	77	47	30	61.04	1.57	1.57	
Kasuwan Shanu Railway	Male	55	35	20	63.64	1.75	1.67	1.05
	Female	72	45	27	62.50	1.67	1.67	
Abattoir	Male	111	86	25	77.55	3.44	1.08	3.19
	Female	27	14	13	51.85	1.08	1.08	
Total		392	280	112				

Chi-square statistic (X^2) = 16.15

Degrees of freedom (df) = 5



Critical value (for $\alpha=0.05$) = 11.07

P-value: < 0.006

CONCLUSION AND RECOMMENDATION

The study reveals a significant prevalence of bovine fascioliasis across three major markets: Fadaman Mada, Kasuwan Shanu Railway, and Abattoir, with an overall prevalence of 69.13%. Fadaman Mada recorded the highest prevalence (72.22%), followed by Kasuwan Shanu Railway (75.00%) and Abattoir (61.64%), with significant differences attributed to environmental factors, grazing conditions, and exposure to intermediate hosts. Adult cattle exhibited higher infection rates (73.17%–85.05%) compared to young cattle, where no cases were detected, highlighting age as a critical risk factor. Market-specific differences were observed in susceptibility among breeds, with Sokoto Gudali cattle showing varying odds of infection, while White Fulani cattle displayed consistent prevalence. Male cattle demonstrated higher odds of infection, particularly in Fadaman Mada and Abattoir, indicating gender-related risk factors that warrant targeted control measures.

Based on the findings of this study, the following recommendations are made to address the high prevalence of bovine fascioliasis and its associated risk factors across the three studied markets:

- i. There should be a focus control efforts on adult cattle, particularly in markets like Fadaman Mada, Kasuwan Shanu Railway, and Abattoir, where prevalence rates are notably high. This includes regular deworming programs and improved management practices to reduce parasite loads.
- ii. Prioritize controlling environmental contamination by *Fasciola* eggs and minimizing cattle exposure to intermediate hosts (e.g., snails) through measures such as improved pasture management, drainage of stagnant water, and maintenance of clean water sources, particularly in Fadaman Mada.
- iii. Strengthen vaccination against the infectious diseases and management practices for young cattle to ensure they remain less susceptible to fascioliasis. Minimize their exposure to contaminated grazing areas and water sources to prevent infection.
- iv. Conducting educational programs and workshops for farmers, herders, and market stakeholders to raise awareness about the risks of bovine fasciolosis and the importance of regular deworming, proper grazing management, and maintaining clean water sources should be enhanced.
- v. Establishing ongoing surveillance programs to monitor changes in prevalence and evaluate the effectiveness of control measures. Regular sampling and prevalence studies are necessary to identify emerging trends and areas requiring intensified efforts.

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