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PREVALENCE OF FASCIOLIASIS AND HEMATO-BIOCHEMICAL ALTERATIONSDUE TO BOVINE FASCIOLIASIS IN FUNTUA CENTRAL ABATTOIR KATSINA STATE, NORTH WESTERN NIGERIA

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ABSTRACT

Fascioliasis remains an important parasitic disease of cattle with significant implications for animal health and productivity. This study investigated the prevalence, intensity, risk factors, and associated haematological and biochemical alterations of *Fasciola* spp. infection in cattle slaughtered at Funtua abattoir, Katsina State, Nigeria. Coprological examination of 134 cattle revealed a low prevalence of 3.73% (5/134), while 96.3% were uninfected. Despite the low prevalence, infected animals exhibited a mean egg count of 4.0 eggs per gram (EPG), corresponding to an egg intensity of 1,000, indicating a moderate parasite burden capable of sustaining environmental contamination and transmission. Sex-specific analysis showed a higher prevalence in males (4.34%) than females (3.41%). Age-specific distribution revealed the highest prevalence among cattle older than 5 years (5%), while no infection was recorded in younger age groups. Breed-wise distribution indicated the highest prevalence in Wadara (10%) and White Fulani (4.88%), with no infection detected in Red Bororo and Azawak breeds. Haematological assessment of infected cattle demonstrated significant reductions in erythrocytic parameters, including red blood cell count, haemoglobin concentration, and packed cell volume, confirming fascioliasis-associated anaemia. Infected animals also exhibited leukocytosis with marked lymphopenia, consistent with chronic parasitic infection and immune modulation. Biochemical analysis revealed elevated liver enzymes (ALT, AST, and ALP), increased bilirubin concentrations, and altered protein profiles, indicating hepatic damage and impaired liver function. These findings demonstrate that even low-prevalence fascioliasis can exert substantial haematological and biochemical disturbances, underscoring the need for sustained surveillance and effective control strategies.

Keywords: Prevalence, Bovine, Fascioliasis, Haematology, Biochemical parameter

INTRODUCTION

Bovine fascioliasis, caused by the liver fluke *Fasciola hepatica*, remains a significant parasitic threat to the global cattle industry, posing considerable economic and health challenges (Colston & Mearns, 2023). This insidious infection not only affects livestock productivity but also has far-reaching implications for public health, as humans can be susceptible to the same parasites through the consumption of contaminated water or vegetation (Poglayen *et al.*, 2023).

As the intricate relationship between the host and the parasite unfolds, a deeper understanding of the hemato-biochemical alterations induced by bovine fascioliasis becomes imperative (Olaogun, 2022). Hematological and biochemical parameters serve as vital indicators, reflecting the dynamic interplay between the host's immune response and the parasite's adaptive strategies (Obeagu & Obeagu, 2024). The study of these alterations not only provides diagnostic insights but also sheds light on the pathophysiological mechanisms underlying the host-parasite interaction (Lucarelli *et al.*, 2019).

The effect of Fasciola infections on the health of indigenous bovines in the area is still not clear. Fasciolosis is an important parasitic disease in tropical and subtropical countries that limits the productivity of ruminants (Brahmbhatt *et al.*, 2021). Moreover, this parasite is located in the liver and bile duct, and damage to the hepatocytes is an essential feature of parasitic infections. Due to the complexity involved in examining the vascular and biliary systems of animals, several clinicopathological changes can be obtained through laboratory tests, specifically biochemical analysis of serum parameters in infected animals. These tests usually include the determination of serum alanine transaminase and aspartate transaminase (ALT, AST), which are the most sensitive indicators of hepatocellular injury. Alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), serum proteins, and bilirubin are also used to evaluate the degree of cholestasis and the synthetic capacity of the liver (Lala *et al.*,2023). The epidemiology of fasciolosis is dynamic and may change with years; therefore, it is important to monitor its development to determine trends in prevalence. Hemato-biochemical studies of fasciolosis in indigenous bovines in the region have not been conducted so far. Hence, the objectives of the current study were to determine the incidence of fasciolosis in native bovine breeds and to estimate the hemato-biochemical alterations in Fasciola-infected and non-infected animals in Funtua, the north-western region of Nigeria.

MATERIALS AND METHODS

Study Area

Funtua is one of the Local Government Areas in Katsina State, Nigeria. It is one of the premiers Local Government in Nigeria created after the Local Government reforms in 1976. It is the headquarters of the Katsina South Senatorial District. It has a conducive weather condition as it lies on the latitude and longitude 11° 32'N and 7° 19'E respectively. The city has an average temperature of 32° C and relative humidity of 44%. It has an area of 448 Km^2 and an estimated population of 225, 571 in 2006 census. The inhabitants of the local Government are predominantly Hausa/Fulani, followed by Yoruba, Igbo, Tiv, Igala, Gwari and Ibra. Their main occupations are trading, farming, animal rearing. And due to advancement, Funtua youth get involved in computing, research, transportation and civil service (Yusuf & Tahir2024).

Collection and Examination of Faecal Samples

The samples were collected from the rectum or from the fresh stool of the sampled cattle on the ground, in plastic sample containers for qualitative and quantitative microscopic examination of *Fasciola* eggs. Faecal samples were processed using faecal sedimentation method as described by (FAO *et al.*,2016). Samples not processed within 24 hours from collection were stored in a refrigerator at 4^0 C. During every faecal sampling, information on sex, breed, approximate age and body condition of the individual animals were recorded (Rizwan *et al.,* 2021).

Collection of Blood Sample

Samples were collected over a period of 12 weeks. During slaughtering, 134 blood samples were collected from Katsina central slaughter house into evacuated EDTA container for haematological analysis and stored at 4°C and into serum separating tubes for biochemical analysis. Sera were frozen in plastic tubes at −20°C. Samples were analysed within 12 hours. The samples were transported to Haematology Laboratory at general hospital Daura Katsina State for haematological analysis and postgraduate research laboratory at Umaru Musa Yar'adua University Katsina for Biochemical analysis (Brahmbhatt, *et al.*,2021).

Haemato-biochemical Studies

Blood and serum samples were collected from the *Fasciola* infected and non-infected animals for routine haematological and serum biochemical analysis. A total of four (4) blood and serum samples from *Fasciola* infected and one hundred and thirty (130) samples from healthy animals were collected during the study and analysed. Haematological analysis of the blood samples was done by using Sysmex particle counter (Model 210) and biochemical analysis of the serum samples were done by with commercial kit (Randox, UK) respectively (Brahmbhatt, *et al.*,2021).

Statistical Analysis

The data obtained was analysed using SPSS version 16. Chi-squares test was employed the to analyse the significance difference between the infection and risk factors. Student t-test wasused to analyse the dataon the haematological and biochemical parameters of the Fasciola-infected and the non-infected samples. Values of $P \leq 0.05$ were considered significant. Results were expressed as means ± SD**.**

RESULTS AND DISCUSSION

The coprological analysis of One Hundred and thirty-four (134) cattle revealed that 5 were infected; indicating a prevalence of 3.73%, while one hundred and twenty-nine (129) showed no signs of infection, accounting for a prevalence of 96.3 %.Despite the low prevalence, infected animals exhibited a mean egg count of 4.0 eggs per gram (EPG), corresponding to an egg intensity of 1,000, which suggests moderate parasite burden among positive cases. This finding is in agreement with a finding of (Kurnianto *et al*., 2022) which implies that although few animals were infected, those harboring the parasite carried a substantial infection load, potentially contributing to ongoing environmental contamination and transmission. The disparity between low prevalence and appreciable egg intensity may reflect effective control measures, such as routine anthelmintic use, improved grazing management, or seasonal factors unfavorable to the intermediate snail host (Megersa, *et al*., 224) (Table 1). This 3.73% prevalence aligns with earlier studies conducted by (Akpabio, 2014), and Okonkwo *et al.*,., (2023) and Shinkafi*et al.*,(2024), which also reported low prevalence rates of 1.7%, 13.5%, and 3.73%, respectively. However, these findings contrast with those of Adedokun *et al.*,(2008), (Njoku-Tony & Okoli, 2011), and Abraham & Jude, (2014), whose research in the southern region of Nigeria documented higher incidences ranging from 23.3% to 75%. The elevated prevalence in the southern region may be attributed to climatic variations and dense vegetation, conducive to the proliferation of the snail vector, thus increasing infection rates. Despite being conducted in Northern Nigeria, studies by (Sabo *et al.,* 2023) and (Njobdi *et al.,* 2023) reported significantly higher prevalence in Gombe (74.3%) and Benue (48.2%) states, respectively, which contradict the lower prevalence rate observed in our study. Discrepancies in sample size, livestock density, and climatic conditions across different regions likely contribute to these variations in prevalence.

Table 1: Prevalence and Intensity of Fasciola Species in Funtua Abattior

Cattle	No. Examined	Prevalence (%)	Mean Egg count	Egg Intensity
No. Positive	05	3.73	4.0	1,000
No. Negative	129	96.27		
Total	134	3.73		

The result of sex specific distribution showed that male was highly prevalent compared to their female counterpart representing the prevalence of 4.34% followed by females with the prevalence rate of 3.41% (Table 2). The increased susceptibility of males to the illness could be the reason for this. These findings is in agreement with the results of some other researchers, like (Oladele-Bukola & Odetokun, 2014) and Aliyu et al., (2014), Adangs et al., (2015), and Ikenna-Ezeh et al., (2019), who found higher prevalence in males than their female counterpart. This conclusion conflict with other research findings (Njok-Tony, 2011; Ardo et al., 2013; Shima et al., 2015; Uwalakaet al.,2019; Banwo et al. 2023; Okolugboet al., 2023; Sabo et al.,2023) whose reported high prevalence in female than male.

Table 2: Sex Specific Distribution of Fascioliasis in Funtua Abattoir

Sex	No. Examined	No. Infected	Prevalence (%)	χ^2 &p=value
Male	46	02	4.35	χ^2 = 8.163, P = 0.670
Female	88	03	3.41	
Total	134	05	3.73	

Regarding the age-specific distribution of the infection, the age group over 5 years old exhibited the highest prevalence at 5%, followed by the 3-4 years age group with 4.76% (refer to Table 3). Notably, no prevalence was recorded in the age groups 0-1 years and 2-3 years. Additionally, the study identified a higher frequency of infection among cattle over 5 years old, consistent with findings by Ardo *et al.,* (2013) and Adang *et al.,* (2015), who reported higher prevalence rates in adults compared to young animals. This contradicts several other findings by Uwalake *et al.,* (2019), Aliyu *et al.,* (2014), and Shinkafi *et al.,* (2024), who observed higher prevalence rates in young calves than adult cattle. The increased susceptibility of adult cattle may be attributed to their prolonged exposure to contaminated pasture.

Table 3: Age Specific Distribution of Fascioliasis in Funtua Abattoir

Age group	No. Examined	No. Infected	Prevalence	χ^2 &p=value
0-1	00	00	00	χ^2 = 8.163, P = 0.670
2-3	07	00	00	
3-4	25	00	00	
4-5	42	02	4.76	
>5	60	03	5.0	
Total	134	05	3.73	

In terms of breed specific distribution, Wadara exhibited the highest prevalence at 10%, while the least prevalence was recorded in White Fulani at 4.88% (refer to Table 4). No prevalence was observed in Red Bororo and Azwak breeds, respectively. Additionally, the research revealed significant prevalence rates of infection in Wadara and White Fulani breeds, whereas Red Bororo and Azwak breeds showed no signs of infection. This suggests that certain breeds are more susceptible to fascioliasis, possibly due to differences in slaughter frequency at the slaughterhouse. This vulnerability could also be linked to variations in extrinsic factors such as environment and management techniques, as well as intrinsic factors including genetics, physiology, and immunity (Modabbernia *et al*., 2024).

These results conflict with findings by Soba *et al.,* (2023) and Olamelekan *et al.,* (2023), which indicated high prevalence rates in Sokoto Gudali and Red Bororo breeds. However, they align with the findings of Ikenna-Ezeh *et al.,* (2019) and Shinkafi *et al.,* 2024 who observed no infections in Red Bororo and high prevalence rates in Wadara and White Fulani breeds.

Table 4: Breed Specific Distribution of Fascioliasis in Funtua Abattoir

Breed	No. Examined	No. Infected	Prevalence (%)	χ^2 &P=value
WF	82	04	4.88	χ^2 = 5.037, P = 0.352
RB	38	00	00	
WD	10	01	10.00	
AZ	04	00	00	
Total	134	05	3.73	

Body condition score also significantly influenced infection patterns. Cattle with medium and poor body conditions had higher prevalence (6.45% and 6.67%) compared to those in good condition (1.37%). This trend indicates that fascioliasis either contributes to deteriorating body condition through chronic hepatic damage or that poorly nourished animals with weakened immunity are more vulnerable to infection (Mpisana *et al*., 2022). Body condition scores, fluke intensity, liver pathology, and carcass quality of different dairy cattle genotypes infected with Fasciola species at high throughput abattoirs in South Africa. *Parasitology Research*, *121*(6), 1671-1682.

The results agree with the findings of Meharenet and Shitu (2021), who reported higher prevalence among cattle of medium condition in Ethiopia, though Uwalaka*et al.* (2019) observed stronger association with poor body condition in Nigeria. Generally, animals with suboptimal nutrition are less capable of resisting parasitic infection and more likely to manifest clinical signs of fascioliasis (Table 5).

Table 5: Body Condition Score Specific Distribution of Fascioliasis in Funtua Abattoir

BCS	No. Examined	No. Infected	Prevalence (%)	χ^2 &P=value
Good	31	01	3.23	χ^2 = 2.303, P = 0.987
Medium	27	01	3.85	
Poor	77	03	3.90	
Total	134	05	3.73	

The haematological profile of cattle infected with *Fasciola* spp. In Funtua abattoir revealed a clear pattern of haematological disruption when compared with their uninfected counterparts. Infected cattle consistently exhibited significantly reduced erythrocytic parameters (RBC), haemoglobin (HGB), and packed cell volume (HCT), indicating the presence of fascioliasis-induced anaemia, which is characteristic of chronic hepatic trematode infection due to blood loss, haemolysis, and nutritional interference caused by migrating flukes. The low RBC showed by Funtua infected animals representing (6.24±2.72[a]) and depressed HGB values (7.60±4.94[a]) compared to the substantially higher levels in uninfected cattle (7.54±2.11[b] and 11.05±3.34[b] respectively). Similarly, HCT values were notably reduced in infected cattle, reinforcing the presence of dilution and haemorrhagicanaemia. The red cell indices (MCV, MCH, and MCHC) showed low value in infected animals compared none infected once. but generally lower trends in infected groups, suggesting normocytic hypochromic anaemia, which is typical of parasitic blood loss, although slight inter-location variations may reflect nutritional or physiological differences among Cattle. The consistently higher WBC values in infected animals point to leukocytosis secondary to fascioliasis-related hepatobiliary inflammation. Collectively, these haematological alterations clearly demonstrate that fascioliasis exerts a significant negative impact on the blood profile of cattle, compromising oxygen-carrying capacity and triggering inflammatory responses, which may ultimately impair productivity, resilience, and overall health performance of affected animals.These results align with the findings of Wyk *et al.* (2012), Egbu*et al.* (2013), and Brahmbhatt *et al.* (2021), who reported similar hematological alterations in fascioliasis-infected animals. The anemia observed may arise from blood loss caused by the hematophagous feeding of adult flukes and tissue damage induced by migrating immature stages (Etim *et al.*,2014; Brahmbhatt *et al.*,2021).

Table 6: Mean±SD of Heamatological Changes between Infected and Uninfected Cattle at Funtua Abattoir

Haematological Parameters	Infected	Range	Uninfected	Range
WBC X 10^3/UL	7.20±1.23[a]	9600–17500	7.70±5.40[b]	6300–12100
RBC X 10^6/UL	6.24±2.72[a]	3.0–4.89	7.54±2.11[b]	5.51–8.9
HGB g/dl	7.60±4.94[a]	5.7–9.6	11.05±3.34[b]	8.5–13.6
HCT (%)	22.60±13.80[a]	19.5–29	33.10±11.72[b]	30–50
MCV (μm^3)	34.93±5.21[a]	61–69	43.32±11.03[b]	46–56
MCH (pg)	11.81±2.34[a]	17–22	14.72±3.45[b]	12–18
MCHC (%)	3.40±40.10a	28–36	4.01±6.30[b]	26–33

Values in rows with different superscripts are significantly different ($P<0.05$). SD=Standard deviation. nSize of sample

The differential leukocyte counts of infected and uninfected animals are presented in (Table 7). Lymphocyte count were significantly lower in infected animals (20.20±4.73[a]) compared with uninfected animals (46.24±19.73[b]), as indicated by different superscripts ($p < 0.05$). This marked reduction in lymphocyte levels in infected animals suggests lymphopenia, which may be associated with stress-induced immunosuppression or redistribution of lymphocytes during active infection. Eosinophil counts were elevated in both infected (13.80±11.91[a]) and uninfected (13.43±11.22[a]) groups, with no significant difference between them ($p > 0.05$). Although eosinophilia is commonly linked with parasitic infections, the lack of significant variation may indicate background exposure to parasites or environmental allergens in both groups.

Neutrophil count did not differ significantly between infected (52.00±43.33[a]) and uninfected animals (54.54±32.01[a]) ($p > 0.05$). This suggests that the infection did not elicit a pronounced neutrophilic response, which is typically associated with acute bacterial infections rather than chronic parasitic conditions.

Similarly, monocyte counts showed no significant difference between infected (6.94 ± 5.20%) and uninfected animals (6.94±5.20[a]) ($p > 0.05$), indicating that monocyte-mediated inflammatory responses were comparable in both groups.the results indicate that infection primarily affected lymphocyte levels, while other leukocyte populations remained statistically similar between infected and uninfected animals. This pattern is consistent with chronic parasitic infections, where immune modulation rather than acute inflammation predominates. This leukocytic pattern suggests an inflammatory response typical of chronic parasitic infection (Brahmbhatt *et al.*,2021). The reduction in eosinophils and monocytes, however, contrasts with reports by Egbu (2013) and Matanovic *et al.* (2007), who recorded elevated levels of these cells in infected animals. These inconsistencies may reflect differences in infection stage, parasite load, or host immune modulation.

Table 7: Mean ± SD of Differentials Changes between Infected and Uninfected Cattle at Funtua Abattoir

Differential counts (%)	Infected(n=5)	Range	Uninfected(n=5)	Range
Lymphocytes	20.20±4.73[a]	29–68	46.24±19.73[b]	45–63
Esonophils	13.80±11.91[a]	2–8	13.43±11.22[a]	0.49–1.11
Neutrphils	52.00±43.33[a]	36–59	54.54±32.01[a]	26–40.5
Monocytes	6.94±5.20a	0.4–3	6.73±5.54[a]	0.83–8.58
Basophils	6.44±5.93[a]	-	6.23±5.54[a]	0.0

Values in rows with different superscripts are significantly different ($P<0.05$). SD =Standard deviation. nSize of sample

The result of biochemical profiles of cattle infected with *Fasciola* spp. In Funtua revealed distinct hepatic and systemic alterations that reflect the pathological impacts of fascioliasis on liver function and protein metabolism. Infected cattle consistently showed elevated liver enzyme activities ALT, AST and ALP compared with uninfected animals, these elevations signify hepatocellular damage, biliary obstruction and active inflammation caused by the migration and feeding activities of flukes within the hepatic parenchyma and bile ducts. Total protein (TP) values were also generally higher in infected animals suggesting chronic inflammatory stimulation, dehydration, or alterations in protein synthesis linked to hepatic dysfunction; however, the extremely variable TP rangesparticularly in Funtua may also point to differing infection intensities or nutritional states. Albumin (ALB), though highly variable, tended to be higher in infected cattle in Funtua which may reflect the complex interplay between reduced hepatic synthesis (expected during liver disease) and compensatory responses or sample variability. Bilirubin levels, both total (TB) and conjugated (CB), were consistently higher in infected cattle, indicating impaired bilirubin clearance due to bile duct obstruction and hepatocellular injury. The biochemical deviations observed elevated transaminases, increased alkaline phosphatase, raised bilirubin concentrations, and highly variable protein fractions collectively demonstrate significant hepatic impairment in infected cattle. These findings are consistent with the pathophysiology of fascioliasis, where liver tissue destruction, cholestasis and metabolic disruption accompany chronic fluke infestation, thereby adversely affecting the metabolic health and productivity of affected cattle. Similar biochemical disturbances have been reported by Brahmbhatt *et al.* (2021), Ellah *et al.* (2014), and Kitila Megersa (2014). Elevated liver enzymes reflect hepatocellular leakage and necrosis, while reduced protein fractions (TP and ALB) signify impaired hepatic synthesis and protein loss due to bile duct damage as reported by (Etim *et al.*,2014). Collectively, these haematological and biochemical derangements confirm that even moderate infections can cause substantial physiological and metabolic stress, culminating in anemia, inflammation, and liver impairment. (Table 8).

Table 8: Mean ± SD of Biochemical Changes between Infected and Uninfected Cattle at Funtua Abattoir

Biochemical parameter	Infected cattle	Uninfected cattle
ALT	68.42±20.30[a]	67.20±33.72[b]
AST	168.14±101.93[a]	168.98±197.73[b]
ALB	32.63±26.44[a]	42.93±53.70[b]
ALP	44.74±20.23[a]	41.22±22.32[a]
TP	153.44±279.91[a]	159.57±252.91[b]
CB	3.94±1.20[a]	4.58±3.96[b]
TB	2.77±1.92[a]	4.04±3.60[a]

ALT = Alanine aminotransferase, AST = Aspartate aminotransferase, ALB= Albumin ALP = Alkaline phophatase, TP = Total protein, CB= Conjugated bilirubin and TB = Total bilirubin

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