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Survey of bovine fasciolosis and assessment of cattle owners' knowledge on its transmission in Mambilla Plateau, Nigeria

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Abstract

The study investigated the occurrence of fasciola infection in cattle through field sampling and assessed the knowledge of cattle owners on the mode of transmission on the Mambilla Plateau, Sardauna Local Government Area of Taraba State. This research was conducted from May to October 2025. A total of 1,000 faecal samples were collected and analyzed, of which 28% tested for fasciola eggs. The occurrence of infection was not significantly associated with the age and sex of the cattle sampled ($p>0.05$). Additionally, questionnaires were administered to herdsmen and cattle owners to evaluate their understanding of the parasite's transmission. Responses revealed that none of the respondents (100%) were aware that snails serve as an intermediate host in the transmission of the parasite. The findings demonstrate that active infection of *Fasciola* species is prevalent among cattle on the Mambilla Plateau yet awareness of its transmission is very low. Further studies are recommended to identify the specific snail species acting as an intermediate host in the area to determine the season most conducive for active transmission.

Keywords: Assessment, Bovine, Fasciolosis, Knowledge, Owners, Survey, Transmission

Introduction

Cattle play a crucial role in strengthening Nigeria's national economy (Biu & Babagana, 2004). However parasitic diseases such as fasciolosis also of significant zoonotic concern pose a major economic challenge by reducing cattle productivity and causing financial losses through the condemnation of affected organs (Biu & Adindu, 2004). Report indicate a notable rise in cattle fasciolosis in recent years (Mitchell, 2002) attributed largely to climatic changes that influence the distribution of *Galba truncatula* the essential

intermediate host (Kenyon *et al.,* 2009; Mas-Coma *et al.*, 2009). Fasciolosis currently has the widest geographical distribution among emerging vector-borne zoonoses, affecting over 51 countries worldwide, and its complex epidemiology presents challenges for disease control and animal husbandry (Mas-Coma *et al.,* 2009). Clinically, fasciolosis manifests in acute, sub-acute and chronic forms. The acute form may present as sudden death, ascites, abdominal haemorrhage, icterus, pallor of membranes and weakness; Sub-acute cases are dominated by weight loss, lethargy and anaemia. The chronic form, the most economically damaging, may be asymptomatic or associated with progressive bottle jaw, ascites, emaciation and weight loss. Sub-clinical infection often goes unnoticed yet causes substantial economic losses through mortalities, reduced fertility, abortions, slow growth and reduction of milk and meat production as well as condemnation of infected livers and carcasses (Phiri *et al.,* 2006). Economic estimates place losses from bovine fasciolosis at approximately €299 per infected cow (Schweizer *et al.,* 2005).

Recent studies have revealed additional dimensions of subclinical pathogenicity, particularly involving parasite-driven immune modulation. Helminthes, including *Fasciola* species, impair the host's immune response, increasing susceptibility to concurrent infections and affecting the reliability of immunologically based diagnostic tests (Claridge *et al.*, 2012). Experimental models demonstrate that co-infection with *Bordetella pertussis* and *Fasciola hepatica* results in suppressed antibacterial immunity due to parasite-induced down-regulation of pathogen-specific Th1 cell responses by Th2 cells. Furthermore, excretory-secretory products of *F. hepatica* may directly suppress antibacterial immunity through proteolytic activity of immune molecules (Brady *et al*. 1999; Dalton *et al*. 2005). Evidence also suggests that *F. hepatica* infection can reduce bystander IFN- $_{\gamma}$ responses and compromise SICCT testing in calves infected with BCG, an avirulent strain of *Mycobacterium bovis* (Flynn *et al*., 2007).

In Northern Nigeria, Fasciolosis caused by *F. gigantica* is considered the most economically important helminth infection of livestock (Schillhorn van Veen *et al.,* 1980). Its prevalence is seasonal and often complicated by concurrent Clostridium novyi infections (Mas-Coma *et al.,* 2005). Conditions such as wetlands, marshy areas and stagnant water promote the proliferation of snail intermediate hosts, while free grazing practices in these areas facilitate completion of the parasite's lifecycle (Iqbal *et al.,* 2007). In some developed countries, prevalence may reach 75% (Spithill & Dalton, 1998). In the Lake Chad region, Gretera *et al.* (2016) recorded a baseline of 41.9% and 46.0% prevalence 6 months post-treatment, attributed to rapid re-infection under the mobile husbandry system. In many underdeveloped humid regions, fasciolosis remains one of the most widespread infections in large ruminants, with prevalence rates reaching 90% in Africa and Indonesia and up to 100 % in India (Spithill *et al.,* 1999).

Fasciolosis also represent a growing public health concern due to increasing reports of human infections resulting from accidental ingestion of *Fasciola* eggs/larvae (WHO, 1995; Mas-Coma *et al.,* 2009).

Given that the Mambilla plateau hosts the majority of cattle in Taraba State, the study aims to assess the current status of fasciolosis in the region and evaluate cattle owners' knowledge regarding its mode of transmission.

Materials and Methods

Study area

The study was carried out on the Mambilla Plateau of Taraba State (Figure 1), which lies on a latitude 50 31'' and 7° 18'' North and on a longitude of 100 18'' and 11° 37'' East and rises over 1,850 meters above sea level, making it the highest plateau in Nigeria (Lenshie *et al.,* 2012). It is characterised by a temperate climate, lush pasture and green vegetation.

Several mountains on the plateau and around it are over 2,000 meters (6,562 ft) above sea level representing the highest elevations in the country. The Mambilla plateau is free of Tsetse flies and supports more than one million herds of cattle

Figure 1. Map of Taraba State showing Sardauna Local Government Area under red colour

(Lenshie *et al*., 2012). Daytime temperatures rarely exceed 25℃ (77.0℉) making it the coldest plateau in Nigeria. It covers an area of approximately 9,389 square Kilometers (3,625 sq m) (Fidelis, 2007) with an annual rainfall of over 1850 millimetres, which spans about nine months (March to November) of the year.

Sampling procedure

Sampling was undertaken between May and October 2025. Faecal samples were collected from a total of 1000 live cattle across the eleven wards of the Mambilla Plateau in Sardauna Local Government Area. A cluster sampling approach was employed, with each ward serving as a cluster. Random number generation was employed to select owners and herd location. The ages of sampled animals were estimated through dentition and through retrieving information provided by herdsmen or cattle owners. Animals aged 0-2 years were classified as young, those >2-5 years as young adults and those older than five years as adults.

Approximately 10 grams) of faecal samples were collected directly from the rectum of each animal using gloved hands and placed into a clean, leak-proof, labelled polythene bag, one for each animal. Samples were transported to the Mambilla Baptist Hospital (MBH) laboratory in a clean, tightly sealed container.

Laboratory analysis

Faecal samples were examined for Fasciola eggs using the sedimentation technique described by Urquhart *et al.* (1996). About 3 grams of faeces was homogenised with water, and the suspension was passed through a coarse mesh sieve (250 µm). The material retained on the screen was thoroughly washed using a fine water jet, and the debris was discarded.

The filtrate was transferred into a conical flask and allowed to stand for 2 minutes, then the supernatant was removed, and the remainder, approximately 12-15ml, was transferred into a flat-bottomed tube and sedimented for another 2 minutes. The supernatant was again drawn off, and a few drops of 5% methylene blue were added. The sediment was screened using a low-powered stereo microscope. Fasciola eggs were readily visible against the pale blue background.

Questionnaire administration

A structured questionnaire was used to assess the knowledge of cattle owners regarding the transmission of fasciolosis on the Mambilla Plateau. Fifty questionnaires were randomly administered in each of the eleven wards, and all responses were recorded.

Data collected included the age and sex of respondents, herd size, management system, and methods of herd expansion. Additional information was obtained on water and feed sources during both rainy and dry seasons. Respondents were also assessed for their awareness of Fasciola infection, including knowledge of its local name and mode of transmission. The questionnaire was administered in Mambilla and Fulfulde, the predominant languages spoken in the study area.

Statistical analysis

Prevalence data were summarized using percentages and tables. Other results were expressed as mean + S.E.M. Chi-square and Fisher's exact test were applied where appropriate. Statistical significance was set at $p< 0.05$.

Results

Distribution of Fasciola species infection in faecal samples of cattle across eleven wards of the Mambilla Plateau, Sardauna LGA of Taraba State

The prevalence of *Fasciola* species infection in faecal samples collected from 1000 cattle across the eleven Wards of the Mambilla Plateau, Sardauna LGA of Taraba State is shown in Table 1: Among the wards, Magu recorded the highest prevalence at 44.00% while Gembu B had the lowest prevalence at 21.05%. The prevalence values for the remaining wards were as follows Mbamnga (25.58%), Gembu A (24.0%), Warwar (24.39%), Ndumyaji (24.13%), Kabri (28.31%), Kakara (37.50%), Titong (23.13%), Mayo-Ndaga (25.73%) and Nguroje (29.35%). Overall Fasciola infection prevalence across all eleven wards was 28.0%. The observed differences in prevalence between wards were not statistically significant ($p>0.05$).

Sex distribution of Fasciola species infection in faecal samples of cattle from eleven wards of the Mambilla Plateau, Sardauna LGA of Taraba State, Nigeria

The sex distribution of Fasciola species infection among cattle sampled across the eleven Wards is presented in Table 2: A greater proportion of the sampled population was females (55.7%) compared to males (44.3%). The prevalence of Fasciola infection was higher in females (30.3%) than in males (25.1%). However, the observed difference in prevalence between sexes was not statistically significant ($p>0.05$).

Table 1: The Prevalence of *Fasciola* infection in cattle faecal samples from eleven wards in Mambilla Plateau, Sardauna LGA of Taraba State, Nigeria

Location	Total cattle sampled	No. of Cattle Positive	
Wards	No. of Cattle per Ward	No.	(%)
Gembu B	19	4	21.1
Mbamnga	43	11	25.6
Gembu A	25	6	24.0
Warwar	41	10	24.4
Magu	25	11	44.0
Ndum-yaji	29	7	24.1
Kabri	166	47	28.3
Kakara	72	27	37.5
Titong	134	31	23.1
Mayo-Ndaga	136	35	25.7
Nguroje	310	91	29.4
TOTAL	1000	280	28.0

$X^2 = 9.865$ $p = 0.4524$

Table 2: Sex distribution of *Fasciola* species infection in faecal samples of cattle from eleven wards of the Mambilla Plateau, Sardauna LGA of Taraba State, Nigeria

Sex	Total no. of Cattle sampled		No.of animals Positive	
	No.	(%)	No.	(%)
Male	443	44.3	111	25.1
Female	557	55.7	169	30.3
Total	1000	100.0	280	28.0

$X^2 = 3.4180$ $p = 0.0645$

Age distribution of Fasciola species infection in faecal samples of cattle from eleven wards of Mambilla Plateau, Sardauna LGA of Taraba State, Nigeria

The age distribution of Fasciola species infection among cattle sampled across the eleven wards is presented in Table 3: The highest prevalence was recorded in cattle older than 5 years (31.6%), while the lowest prevalence occurred in those aged 1–2 years (23.5%). Cattle aged ≥2–5 years had a prevalence of 26.2%. The differences in infection prevalence among the age groups were not statistically significant ($p > 0.05$).

Knowledge of cattle owners and herdsmen on the transmission of Fasciola infection on the Mambilla Plateau, Sardauna LGA, Taraba State, Nigeria

A total of fifty (50) questionnaires were administered to cattle owners and herdsmen on the Mambilla Plateau to assess their knowledge of the mode of transmission of Fasciola infection. All respondents were male and aged 20 years and above. Herd sizes ranged from 25 to over 50 cattle, and all respondents practiced the extensive management system. Herd expansion was primarily achieved through natural breeding and the purchase of animals from cattle markets (Table 4).

During the rainy season, all respondents relied solely on grazing for feed. In the dry season, cattle were moved to valleys and river banks to access the remaining green pastures, with no supplemental feeding provided. Regarding water sources, 48 respondents (96%) used natural streams, rivers, and ponds, while 2 respondents (4%) used improvised dams and wells during the dry season (Table 4).

Encounters with snails during grazing were reported by 27 respondents (54%), while 23 (46%) had never observed snails. Among those who had seen snails, 22 (44%) observed them during the rainy season, 1 (2%) in the dry season, and 4 (8%) reported year-round sightings. The locations of snail sightings included pasture on hills (14 respondents, 28%), pasture in valleys (10 respondents, 20%), and water sources where cattle drink (3 respondents, 6%) (Table 4). None of the respondents (100%) were aware that snails act as intermediate hosts in the transmission of *Fasciola* species (Figure 2).

All respondents were aware of fasciolosis infection and referred to it locally as Ciwon hanta, Mbalkum, or Balki. Only 1 respondent (2%) claimed to be able to identify the infection on the farm (Figure 2) When asked about possible routes of infection, 3 respondents (6%) believed it occurred through

Table 3: Age distribution of *Fasciola* species infection in faecal samples of cattle from eleven wards of Mambilla Plateau, Sardauna LGA of Taraba State, Nigeria

Age (years)	Total no. of cattle sampled		No. of cattle positive	
	No.	(%)	No.	(%)
1-2	98	9.8	23	23.5
>2-5	535	53.5	141	26.4
>5	367	36.7	116	31.6
Total	1000	99.0	280	28.0

$X^2 = 4.0850$ p = 0.1297

Table 4: General information from questionnaire administered to cattle owners in Mambilla Plateau, Sardauna LGA of Taraba State, Nigeria

General Information			
System of management	Intensive 0(0%)	Semi intensive 0(0%)	Extesive 50(100%)
Increase herd size	Purchase only 0(0%)	Calving only 2(4%)	Purchase & calving 48(96%)
Feeding in rainy season	Range browsing 50(100%)	Feed supplement 0(0%)	Others 0(0%)
Feeding in dry season	Valley browsing 50(100%)	Feed supplement 0(0%)	Others 0(0%)
Source of drinking rainy season	Streams and rivers 100%	Improvised source 0%	Others 0%
Source of drinking dry season	Streams and rivers 48(96%)	Improvised source 2(4%)	Others 0(0%)
What season are snails seen	Rainy 22(44%)	Dry 1(2%)	All year round 4(8%)
Where do you normally see snails	Hills 14(28%)	Valleys 10(20%)	In water 3(6%)

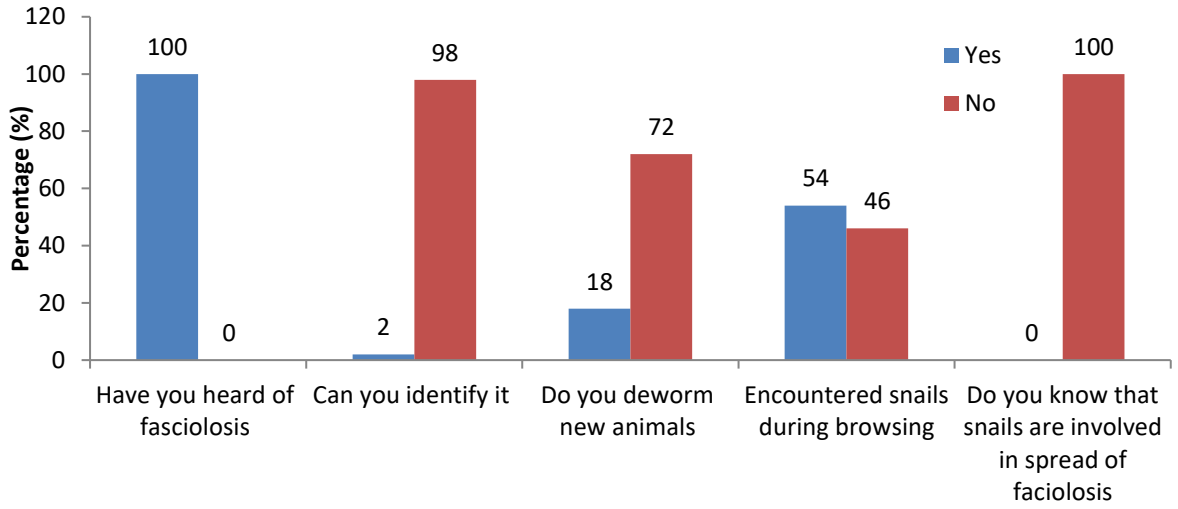

Figure 2: Questionnaire assessing the level of knowledge of Cattle owners on Fasciolosis on the Mambilla Plateau of Taraba State, Nigeria

ingestion of contaminated pasture, 41 (82%) cited contaminated water, and 6(12%) admitted they did not know (Figure 3).

Preventive measures varied: 19 respondents (38%) reported taking no preventive action, 18(36%) avoided grazing near infested water sources, and 13 (26%) used regular anthelmintic treatments such as albendazole, levamisole, and ivermectin (Figure 3).

Overall, the questionnaire results indicate that while cattle owners and herdsmen were aware of the existence of Fasciola infection in cattle, none understood the role of snails as intermediate hosts in its transmission.

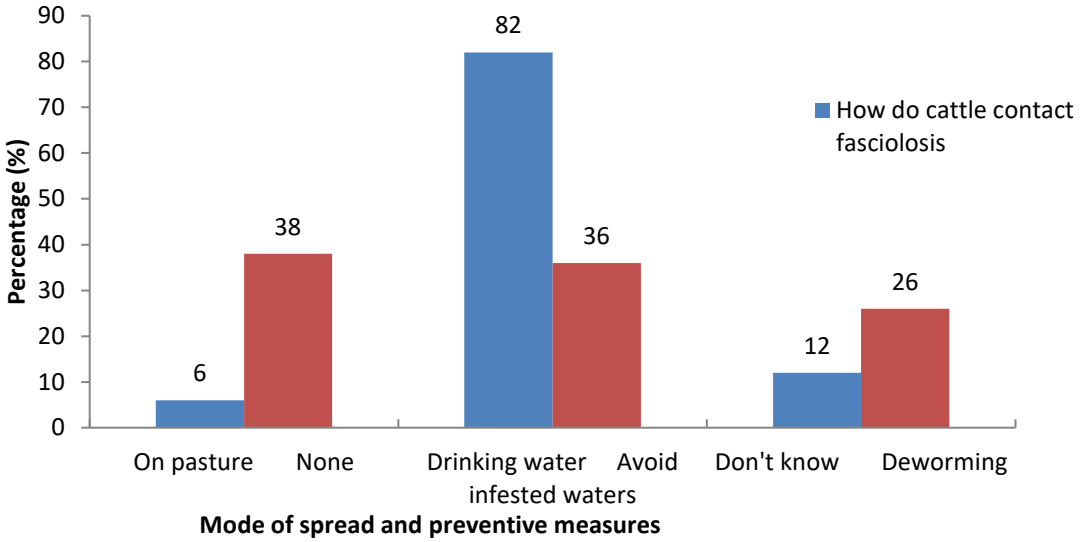

Figure 3: Questionnaire assessing the knowledge of Cattle owners on mode of spread of Fasciolosis on the Mambilla Plateau of Taraba State, Nigeria

Discussion

Faecal samples collected from cattle on farms showed that 28% (280/1000) were positive for *Fasciola* eggs. This prevalence is considerably lower than the 76.9% reported by Sugun *et al.* (2010) in a 12-month survey across five Local Government Areas in Bauchi State. The lower rate observed in this study may be due to its restriction to a single Local Government. Environmental factors such as ambient temperature may also contribute. Dinnik & Dinnik (1963) reported that cercarial development in infected snails can be inhibited when mean maximum temperatures fall below 20℃, a condition common on the Mambilla Plateau during the rainy season when this study was conducted, potentially reducing infection rates. Conversely, the prevalence found here is higher than that reported by Aliyu *et al.* (2014) in Zaria (14.5%), likely due to differences in sample size and seasonality.

Sex-based analysis indicated that female cattle had a slightly higher infection rate (30.3%) than males (25.1%), though the difference was not statistically significant. This aligns with studies by Ulayi *et al.* (2007) in Nigeria, Dhar *et al. (*1988) and Fatima *et al.* (2008) in Egypt, Phiri *et al.* (2005) in Zambia, Keyyu *et al.* (2005) in Tanzania, and Vassilev (1999) in Zimbabwe, all of which reported higher infection rates in females. Doyle (1971), Soulsby (1982), and Schillhorn Van Veen (1997) attributed this to hormone-mediated relaxation of immunity during pregnancy and lactation, increasing susceptibility. Additionally, female cattle often remain on farms longer for breeding purposes, resulting in prolonged exposure (Schillhorn Van Veen *et al.,* 1980). Phiri *et al.* (2005) noted that sex-related susceptibility may vary depending on predisposing factors.

Infection was highest in adult (31.6%) and young adult (26.4%) cattle, consistent with previous findings (Ogunrinade & Ogunrinade, 1980; Fabiyi & Adeleye, 1982; Ardo *et al*., 2013). Keyyu *et al.* (2005) similarly observed that older animals have longer exposure periods, increasing their risk of infection even when grazing the same pastures.

The extensive management system was predominant among respondents, likely due to the nine-month rainy season that ensures abundant forage on hills and valleys, with reliable water sources in streams, rivers, and ponds. Snails were reported by 54% (27/50) of respondents, mostly on hills (28%) and valleys (20%) during the rainy season, with few sightings in water sources (6%). All respondents (100%) were unaware that snails play a role in *Fasciola* transmission, reflecting a lack of interaction with veterinarians and the influence of unqualified practitioners. While all respondents had heard of fasciolosis, awareness was largely based on observing infected animals sold to butchers. Preventive practices were limited: some relied on routine deworming, others attempted to avoid grazing near perceived “fluke-infested” waters (actually leech-infested), and none dewormed new animals before herd introduction, highlighting a widespread misunderstanding of the parasite’s transmission.

Fasciolosis is endemic across all eleven wards of the Mambilla Plateau, with an overall prevalence of 28%. Female and adult cattle exhibited higher infection rates than males and younger animals. The extensive management system predominates, and while most cattle owners are aware of the disease, they lack knowledge of its transmission and appropriate preventive measures. This underscores the need for targeted education and veterinary intervention to reduce infection rates and improve herd health.

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Conflict of Interest

The authors declare no conflict of interest.

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