# GASTROINTESTINAL PARASITES OF CATTLE IN KEBBI STATE, NORTH-WEST NIGERIA

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**Abstract:** Cattle are considerably important for purposes such as meat, milk, pulling of plows and carts, and indicator of economic status in many parts of the world. Unfortunately, their health and productivity are often negatively influenced by numerous gastrointestinal (GI) parasites. In the present study, faecal samples of 171 randomly-selected cattle from Birnin-Kebbi and Jega, Kebbi State, North-west Nigeria were analysed using standard direct smear and floatation methods between May and July, 2016.67.2% (115/171) of the examined cattle were infected with one or more GI parasites. The parasites identified include six nematode species among which *Haemonchuscontortus* had statistically highest ($P < 0.001$) prevalence (51.5%), followed in decreasing order by *Trichostrongylus* sp. (19.3%), *Strongyloidespapillosus* (11.1%), *Oesophagostomum* sp. (6.4%), *Bunostomum phlebotomum* (1.2%), and *Trichuris ovis* (1.2%). Only one protozoan, *Eimeria* sp. (9.4%) was recorded. Males (63.5%) and females (68.9%) had statistically similar prevalence ($P > 0.05$). Likewise, the parasitic infections were neither age nor breed biased in this study. Among infected cattle, the commonest double infection combination was *Haemonchus* + *Trichostrongylus* (23/45, 20.0%; $P < 0.001$). The recorded egg outputs were low in all infected cattle. This study has shown that there is high prevalence of GI parasites, suggestive of heavy pasture and environmental contamination with the eggs/oocysts of GI parasites in the study area. Therefore, it is desirable to effectively enforce, and possibly overhaul, all extant policies and regulations guiding the wholesome health of cattle towards sustainable optimum productivity in the study area.

**Keywords:** Cattle, gastrointestinal helminthes, *Haemonchuscontortus*, *Eimeria* sp., mixed infections, Nigeria

## Introduction

Cattle and some other ruminants are of considerable importance in livestock faming worldwide. Particularly, cattle have contributed immensely to human survival for several thousands of years having been used for purposes such as meat, milk, pulling of plows and carts, and indicator of economic status. Even in some African tribes, cattle are a form of currency (Rosmann, 2017). In addition, many by-products of cattle are used to make some products for home, health, food and industry (Anon, 2018).

However, several gastrointestinal (GI) parasites are known to infect cattle and other ruminants of agricultural importance, exhibiting varying grades of pathological effects and innate negative impact on the health and productivity of the animals. In most cases, ruminants of younger age group are worst sufferers and the infections often culminate in hosts' death (Bathia *et al*., 2010). In view of these facts, various studies have been documented on GI parasitic infections in cattle from Nigeria (Biu *et al*., 2009; Shitta and James-Rugu, 2013; Yahaya and Tyav, 2014; Amuzie *et al*., 2018) and other corners of the world (Marskole *et al*., 2016; Gunathilaka *et al*., 2018).

The present study was designed to determine the epidemiology of the GI parasitic infections of cattle in some parts of Birnin-Kebbi and Jega towns in Kebbi State, North-west Nigeria, from where no previous record on cattle GI infections is known to the authors. It is hoped that the findings of this study will assist handlers of cattle and related ruminants on one hand, and animal health policy makers and implementation mercenaries on the other hand in effective GI parasitic diseases control in the study area.

## Materials and Methods

### *Study area*

The study area consisted of Birnin-Kebbi and Jega, the headquarter towns of Birnin-Kebbi and Jega Local Government areas, respectively, in Kebbi State, North-West Nigeria. In addition, Birnin-Kebbi is the capital of Kebbi State. The study area lies between latitudes 12° 2′ and 12° 6′ N, and longitudes 4° 2′ and 4° 4′ E. In Kebbi State, rainy season is between May and October and the mean annual rainfall is about 500 mm. The mean annual temperature varies considerably but usually stands at about 70ºC (Anon, 1993). The predominant vegetation is Sudan savanna. The main occupation of the people is agriculture characterized with crop production (mainly grains), animal rearing and fishing (Anon, 1993; 2017). Three locations in Birnin-Kebbi town namely Bulasa, Dikko area and Abattoir, and one in Jega town namely Jega Private Farm were selected for the study.

### *Study cattle and faecal sample collection*

The cattle used in this study consisted of a total of 171 randomly-selected cattle including 133 Sokoto Gudali, 8 Red Bororo and 30 Cross Breed. All the animals were reared under semi-intensive system of animal husbandry. Faecal sample was collected directly from the rectum of each study cattle using the index finger protected with disposable hand gloves. On few occasions, the upper parts of freshly-voided faeces were collected. The samples were collected in clean labeled sample bottles and immediately transported to the laboratory for parasitological analysis. However, samples which could not be examined within 24 h were preserved by refrigeration at 4ºC. All sample collection was done between May and July, 2016.

### *Parasitological analysis of faecal samples*

All the samples were analysed at the Entomology and Parasitology Laboratory, Faculty of Veterinary Medicine, Usman Danfodio University, Sokoto, North-west Nigeria, using direct smear and floatation methods. Direct smear method was performed as described by Urguahart and Amour (1997) and Bhatia *et al*. (2010). For each faecal sample, a small quantity was mixed with a drop of normal saline on a clean, dry, grease-free glass slide, covered with a cover slip and examined microscopically.

Analysis using floatation method was performed as described by Chauhan and Agarwal (2006) and Bhatia *et al*. (2010). For each faecal sample, 1 g was mixed with 5 ml distilled water, and filtered through a fine sieve. The filtrate was then mixed with 5 ml of saturated sodium chloride solution (specific gravity: 1.2). The resultant mixture was then transferred into a test tube, filled up to the brim with the saturated sodium chloride solution. Subsequently, a clean cover slip was carefully placed on the mouth of the tube and left undisturbed for about 30 min at room temperature. The cover slip was carefully removed using forceps, placed on a clean glass slide and examined microscopically. For identification of trematodes, the same procedure was repeated for each faecal sample using zinc sulphate (specific gravity: 1.3) as floatation medium.

All microscopic examinations were done using x10 and/or x40 objectives and the characteristic morphological features of parasites' eggs/oocysts/segments were used for identification (Soulsby, 1982).

***Statistical analysis***

The data obtained were analysed by calculating prevalence values of infection based on study locations, cattle genders, age and breeds. Arithmetic mean intensities of parasites' eggs or oocysts/g of faeces were also calculated. Chi-Square was used to compare percentages for significant differences.

**Results and Discussion**

Out of the 171 cattle examined, 115 (67.2%) were infected with one or more GI parasites. This high overall prevalence of GI parasites in the study area agrees with reports from some other parts of Nigeria (Yohanna *et al*., 2012; Kingsley *et al*., 2013; Kalu *et al*., 2018) and foreign countries (Huang *et al*., 2014; Marskole *et al*., 2016). The high total prevalence of the parasites in the examined cattle indicates that the cattle are exposed to the parasites' infective stages. The high prevalence is also possibly a pointer to inadequacy of care given to the cattle (Amuzie *et al*., 2018).

The parasites identified include six nematode species namely, *Haemonchuscontortus* (88/171, 51.5%), *Trichostrongylus* sp. (33/171, 19.3%), *Strongyloidespapillosus* (19/171, 11.1%), *Oesophagostomum* sp. (11/171, 6.4%), *Bunostomumphlebotomum* (2/171, 1.2%), and *Trichuris ovis* (2/171, 1.2%), and one protozoan namely, *Eimeria* sp. (16/171, 9.4%). The prevalence were significantly different ($P < 0.001$). The GI nematode and protozoan parasites recorded in cattle in the study area had been variously reported in some studies (Yohanna *et al*., 2012; Huang *et al*., 2014; Marskole *et al*., 2016; Shitta and James-Rugu, 2013; Yahaya and Tyav, 2014; Gunathilaka *et al*., 2018). *H. contortus* was the commonest GI parasites; this might indicate innate adaptability or, at least, the relative conduciveness of the prevailing environmental factors for the survival of the eggs and larvae of the parasite. Literature has shown *H. contortus* as one of the most common and pathogenic causes of gastrointestinal nematodosis in cattle and other ruminants (Jacquiet *et al*., 1998; Bhatia *et al*., 2010). It is equally important to note that *Trichostrongylus* sp. was next in prevalence to *H. contortus* in this study. However, *Fasciola* and *Schistosoma* species were not recorded in the present study, though they featured prominently in some related previous reports from within and outside Nigeria (Sardar *et al*., 2006; Dinka *et al*., 2010; Ngele and Ibe, 2014). This could be explained by the known phenomenon that the prevalence and epidemiological features of GI parasites in livestock depend on local environmental conditions and management practices (Teklye, 1991).

Table 1 gives the study location and sex wise prevalence of GI parasitic infections in cattle in the study area. Abattoir study location had statistically highest prevalence (78.1%; $P < 0.001$). The examined cattle from Abattoir might have been from diverse and different parts of the study area and beyond. Pooling together of cattle from different states in Nigeria and neighbouring countries had earlier been documented (Yahaya and Tyav, 2014). Moreover, the possibility of consistent pasture and environmental contamination due to the eggs/oocysts of the parasites cannot be overruled, thereby paving way for infection of new cattle entrants in the location. The possible cumulative impact is diminished health status of such new cattle entrants, especially young ones which often exhibit worst clinical manifestations of infection (Bhatia *et al*., 2010).

**Table 1: Prevalence of gastrointestinal infections in cattle according to study location and sex in Birnin-Kebbi and Jega, Kebbi State, North-west Nigeria**

| | No. Examined | | | No. (%) Infected | | |
|---|---|---|---|---|---|---|
| **Study location*** | **Female** | **Male** | **Total** | **Female** | **Male** | **Total** |
| Bulasa (BK) | 20 | 10 | 30 | 13(65.0) | 05(50.0) | 18(60.0) |
| Dikko Area (BK) | 21 | 09 | 30 | 11(52.4) | 6(66.7) | 17(56.7) |
| Abattoir (BK) | 14 | 27 | 41 | 12(85.7) | 20(74.1) | 32(78.1) |
| Jega Private farm | 64 | 6 | 70 | 46(71.9) | 2(33.3) | 48(68.6) |
| **Total** | **119** | **52** | **171** | **82(68.9)** | **33(63.5)** | **115(67.3)** |

*BK represents Birnin-Kebbi

Sex wise (Table 1), males (63.5%) and females (68.9%) had statistically similar prevalence ($P > 0.05$). The recorded GI infections being equally expressed among sexes in the present study is in conformity with some earlier reports (Marskole *et al*., 2016; Gunathilaka *et al*., 2018), but in contrast with some other reports where males were more infected (Yohanna *et al*., 2012; Shitta and James-Rugu, 2013). The prevalence of GI parasites in relation to age and breed are summarized in Table 2. The prevalence in the age group < 48 months (69.1%) was statistically similar to that in the age group > 48 months (66.4%; $P > 0.05$). This is in contrary to the reports of Regassa *et al*. (2006), Shitta and James-Rugu (2013), and Gunathilaka *et al*. (2018) in which GI parasitic infections were age-biased. Likewise, in the present study, the examined cattle breeds had statistically similar prevalence ($P > 0.05$) in contradiction to some previous studies in which cattle breed was found to be an important determinant of GI infections (Sardar *et al*., 2006).

**Table 2: Prevalence of gastro-intestinal parasites of cattle according to age and breed in Birnin-Kebbi and Jega, Kebbi State, North-west Nigeria**

| **Parameter** | **No Examined** | **No (%) Infected** |
|---|---|---|
| | 171 | 115 (67.3) |
| **Age (months)** | | |
| < 48 | 55 | 38(69.1) |
| > 48 | 116 | 77(66.4) |
| **Breed** | | |
| Sokoto Gudali | 133 | 92(69.2) |
| Red Bororo | 08 | 5(62.5) |
| Cross Breed | 30 | 18(60.0) |

Among the infected cattle (Table 3), the prevalence of single (62/115, 53.9%), double (45/115, 39.1%) and triple (6/115, 5.2%) infections were significantly different (P < 0.001). The higher occurrence of single, compared to mixed, infections in this study conform with some previous reports (Regassa *et al*., 2006; Kalu *et al*. 2018). The occurrence of mixed infections(double and triple) in the study area agrees with some earlier reports from Nigeria (Yohanna *et al*., 2012; Kalu *et al*. 2018) and elsewhere (Marskole *et al*., 2016; Kagenda and Angwech, 2018).*H. contortus* featured in all mixed infections recorded in the study area, possibly due to its highest infection rate. Among double infection cases, the commonest combination was *Haemonchus* + *Trichostrongylus* (23/45, 20.0%; P < 0.001), while all the triple infections had similar prevalence. Interestingly, both *Haemonchus* and *Trichostrongylus* featured in all cases of triple infection in this study. The concurrent presence of *Haemonchus* and *Trichostrongylus* in some cattle in the study area portends severe hardship on such cattle sufferers. This is because, *Haemonchus* species are voracious blood suckers with resultant severe morbidity including anaemia, while *Trichostrongylus* species also cause a number of disease conditions including osteoporosis, dehydration, anaemia and retarded growth (Bhatia *et al*., 2010).

**Table 3: Single and mixed gastrointestinal parasitic infections in cattle in Birnin-Kebbi and Jega, Kebbi State, North-west Nigeria**

| Parasite species | No. (%) infected | | |
|---|---|---|---|
| | Birnin-Kebbi (n = 67) | Jega (n = 48) | Total (n = 115) |
| **Single infections** | | | |
| *Strongyloidespapillosus* | 3 (4.5) | 7 (14.6) | 10 (8.7) |
| *Trichostrongylus*sp. | 3 (4.5) | 1 (2.1) | 4 (3.5) |
| *Bunostomumphlebotomum* | 0 (0) | 2 (4.2) | 2 (1.7) |
| *Haemonchuscontortus* | 24 (35.8) | 13 (27.1) | 37 (32.2) |
| *Eimeria*sp. | 0 (0) | 9 (18.8) | 9 (7.8) |
| **Double infections** | | | |
| *Haemonchus* + *Trichostrongylus* | 19 (28.4) | 4 (8.3) | 23 (20.0) |
| *Haemonchus* + *Eimeria* | 2 (3.0) | 2 (4.2) | 4 (3.5) |
| *Haemonchus* + *Oesophagostomum* | 7 (10.5) | 2 (4.2) | 9 (7.8) |
| *Haemonchus* + *Strongyloides* | 4 (6.0) | 3 (6.3) | 7 (6.1) |
| *Haemonchus* + *Trichuris* | 0 (0) | 2 (4.2) | 2 (1.7) |
| **Triple infections** | | | |
| *Haemonchus* + *Trichostrongylus* + *Strongyloides* | 2 (3.0) | 0 (0) | 2 (1.7) |
| *Haemonchus* + *Trichostrongylus* + *Oesophagostomum* | 2 (3.0) | 0 (0) | 2 (1.7) |
| *Haemonchus* + *Trichostrongylus* + *Eimeria* | 1 (1.5) | 1 (2.1) | 2 (1.7) |

The arithmetic mean intensity values of *B. phlebotomum*, *Eimeria* sp. and *Trichurisovis* were 6.0, 17.0 and 1.0 eggs or oocysts/g of faeces, respectively; the ranges of those of *S. papillosus*, *Trichostrongylus* sp., *H. contortus* and *Oesophagostomum* sp. were 8.0-10.0, 2.0-7.0, 6.0-34.0 and 1-1.2 eggs/g of faeces, respectively. This implies that all the examined cattle had low GI parasite egg outputs. This may be because the faecal samples were not examined using any more quantitative concentration technique. Nevertheless, while some workers documented higher occurrence of moderate egg output (Marskole *et al*., 2016), some others observed generally low GI parasite egg output (Regassa *et al*., 2006) in cattle.

## Conclusion

This study has shown that most (67.2%)of the cattle in Birnin-Kebbi and Jega areas of Kebbi State are infected with one or more GI parasites; suggestive of heavy pasture and environmental contamination with the eggs/oocysts of GI parasites in the study area. In addition, the study showed that the commonest parasite is *H. contortus* (51.5%), and that GI infections are equally expressed among sexes, age groups, and breeds of cattle in the study area. Therefore, it is urgently desirable to effectively enforce, and possibly overhaul, all extant policies and regulations guiding the wholesome health of cattle towards sustainable optimum productivity in the study area.

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