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Prevalence of *Haemonchus contortus* of Small Ruminants Slaughtered at Talata Mafara Central Abattoir, Talata Mafara Local Government, Zamfara State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Haemonchosis is a common disease in small ruminants caused by *Haemonchus contortus*, a blood sucking parasite. This study was conducted to determine the prevalence of *Haemonchus contortus* in small ruminants slaughtered at Talata Mafara Central Abattoir. A total of 381 faecal samples from slaughtered animals were examined from January to April, 2024 by Centrifugal flotation method. Overall prevalence of *Haemonchus contortus* in the study area was 26.24%. Out of 235 sheep and 146 goats examined during the study period, (15.74%) of sheep and (43.15%) of goat were

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infected. Female animals were found to harbour more *Haemonchus contortus* (29.4%) than males (18.58%). Similarly, adult small ruminants recorded higher prevalence of (27.5%) than young small ruminants (18.5%). There was significance association (P>0.05) between infection rate and sex of small ruminants. The results showed that *Haemonchus contortus* was prevalent in both sheep and goats in Talata Mafara Central abattoir. Adult, lavae and eggs of *Haemonchus contortus* all were detected during the study period. It is recommended that government should educated the farmers on the epidemiology of *Haemonchus contortus* and provide veterinary services available to them. Farmers also should improve their farming system in order to avoid risk factors.

Keywords: Gastrointestinal; haemonchosis; prevalence; parasite; small ruminants.

1. INTRODUCTION

"Haemonchus contortus, the "barber's pole" worm, a blood sucking parasite of the abomasum, is one of the significant helminth parasites of sheep and goat belonging to the Kingdom: *Animalia*, Phylum: *Nematoda*, Class: *Secernentea*, Subclass: *Rhabditia*, Order: *Strongylida*, Family: *Trichostrongylidae*, Genus: *Haemonchus,* Species *Haemonchus contortus"* [1]. "*Haemonchus contortus* is known as the large stomach worm of ruminants because they are the largest worm of the abomasum" [2,3]. *"Haemonchus contortus* has a direct life cycle. It is transmitted horizontally through grazing on natural pasture lands by third stage (L3) larvae. It has a two-phase life cycle, a free-living and a parasitic within the abomasum of the host. The eggs reach the ground through faeces of the parasitised ruminants, thus infecting herbage. Then, the eggs evolve to first stage larvae (L1), continuing to second stage larvae (L2) to third stage larvae (L3), which is the infective stage of this parasite" [4]. *"Haemonchus contortus* possesses a unique feature, which refers to inhibited development, termed 'hypobiosis' Seasonal changes, particularly temperature changes, have been proposed to be the major determinant of hypobiosis. The feature is activated when opportunities for transmission of the larvae are restricted, which is a parasitic adaptation in cold weather. Hypobiosis can also occur in high temperature conditions especially during the dry season" [4].

"The disease caused by *Haemonchus contortus* is called *haemonchosis"* [1]. *"Haemonchosis* infection leads to anaemia, primarily due to the blood-sucking activity, and consequently potentially occasional death of the infected animals. *Haemonchus contortus* produced a haemolytic factor that caused distinct morphological changes on the surface of erythrocytes of affected animal. Nevertheless, the primary consequence of the infection is the significant reduction in the production of infected animals, which includes a decrease in the growth of young animals, decrease in milk production of lactating animals and in fibre production, all these result in severe economic losses to farmers" [4]. "The pathogenesity of *haemonchosis* is due to decrease in cell volume (RBC, WBC and Hb), body weight and wool quality as well as a decrease in erythrocyte and lymphocyte levels due to the blood-sucking habits of the worms. Each worm removes about 0.05 ml of blood per day by ingestion and seepage from the lesions, so that a sheep with 5000 *H. contortus* may lose about 250 ml daily" [4]. *"Haemonchus contortus* has a worldwide distribution in both temperate and tropical zone" [1,4]. Thus it has been generally recognized that *haemonchus contortus* is a parasite restricted to the warm and wet countries where sheep and goats are raised.

"Prevention is through controlling the density of livestock (stocking rate). Overstocking forces the animals to graze closer to faecal material and closer to the ground, Periodic deworming, Separating age groups in the more intensive production systems, reducing the effects of gastro-intestinal parasites by assuring grazing management to minimize the uptake, adjusting stocking rate, optimum use of safe pastures" [5,6]. "Proper management system and regular deworming of animals are recommended" [6].

"Small ruminants, especially sheep and goats, constitute an important source of animal protein to many Nigerians. A lot of socio-economic importance is therefore attached to ownership of these animals that, in some cases, may be the only reliable wealth of a rural household" [7,8].

Presently**,** studies on the status of *Haemonchus contortus* in Talata Mafara Local Government of Zamfara State, Nigeria is scanty, and to the best of our knowledge, no study has been intensively taken to determine the burden of *Haemonchus*

contortus and its implication on small ruminant production in the study area. Therefore the present study was aimed at determining the prevalence of *Haemonchus contortus* and assess the prevalence based on age and sex of the small ruminants slaughtered at Talata Mafara Central Abattoir, Zamfara state, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out at Talata Mafara central abattoir in Talata Mafara Local Government, the headquater of the LGA about 15km from Bakalori Dam on the sokoto River, located within longitude $6^0$03'34.96''E and $6^0$06667^{0}E and latitude $12^0$34'23''N and 12.56667^{0}N. It cover land area of 1,430 km^2 and has estimated population projection of 397,897 at 2023 [9]. The mean annual rainfall is 798mm. "The area is mainly populated by Hausa and Fulani, farming is their major occupation and they practice the same religion and culture" [10]. "Small ruminants are bought from local animals markets in villages or in some cases imported from neighboring countries in large numbers. They are kept close to the abattoirs or in homes as beast of burden, and are usually taken out daily for grazing in order to reduce the cost. This practice of extensive management among several other factors could have been responsible for the pockets of infections observed during the drier months of the year when rainfall tend to be scarce resulting in the tendency of animals to aggregate at the few available watering spots after grazing for the day" [6].

2.2 Study Design

The study was conducted from January to April 2024 in the central abattoirs of Talata Mafara Local Government Area. Selection of small ruminants (sheep and goats) was done using systematic random sampling throughout the collection period. The sample size was calculated using the formula described by Thrusfield [11]; thus:

$$n = \frac{1.96^2 exp(1 - Pexp)}{d^2}$$

Where;

n = sample size

Pexp = expected prevalence (54.9% of [6]).
d = desired absolute precision of 5% (0.05).

By using 95% level of confidence and expected prevalence was 54.9 from the previous prevalence according to [6]. In a study conducted in Zuru Emirate of Kebbi state the allowable error equal to 5%. And desired absolute precision of 5%. A sample size was arrived at as shown in the following calculation;

$$n = \frac{1.96^2 \times 0.549(1 - 0.549)}{(0.05)^2}$$

$$n = \frac{3.8416 \times 0.549(0.451)}{0.0025}$$

$$n = \frac{3.8416 \times 0.549(0.451)}{0.0025}$$

$$n = \frac{0.953}{0.0025}$$

$$n = 381.3$$

2.3 Study Animal

The study animals were 381 indigenous small ruminants breeds kept under traditional management system with different sex (male and female) and age (young and adults). 235 were sheep and 146 were goats, 54 were young and 327 were adults, slaughtered at Talata Mafara Central Abattoir from January to April 2024. The, age and sex of the animals examined were recorded and kept. The ages of the experimental animal were estimated using teeth eruption, those animals with the age of less than one year was considered as young while those greater than or equal to one year were considered as adult based on the method described by Vatta et al. [12].

2.4 Sample Collection

Faecal samples of approximately 5 gram were collected from the abomasum of the small ruminants using clean disposable hand gloves at the early hours of each week. A total number of 30 faecal samples, from small ruminants were collected weekly for 13 weeks, the collected samples were put into sample bottles containing 10% formalin and the necessary information of the animal (sex, and age) were labelled and Put in a cooler box with ice pact and then transported

to zoology laboratory, Kebbi State University of Science and Technology Aliero, for examination.

2.5 Sample Examination

Feacal sample were examined for *Haemonchus contortus* by Centrifugal flotation method within four to five hours after collection using the methods described by Mona [1]. The discovered worms were pick using forceps, and recorded for each animals, then examined and identified by using identification keys described by Mona [1].

2.6 Data Analysis

The collected data were coded into appropriate variables and entered into Microsoft Excel Worksheet. All analyses were performed using statistical data package for social science (SPSS) version 20.0. The prevalence was calculated by dividing the number of positive samples by the total number of samples examined and times 100. Percentage (%) to measure prevalence and Chi-square (x^2) was used to test the existence of association between, infection, age and sex of small ruminants. In all thes e analysis, confidence level was 95% and $P<0.05$ were set for significance.

3. RESULTS

Out of 381 small ruminants examined for *Haemonchus contortus* 100 (26.24%) were found positive with *Haemonchus contortus*, the rate of infection in small ruminants (sheep and goats) was 26.24% (Table 1). Out of 381 small ruminants 235 were sheep, 37 out of 235 sheep tested positive with *Haemonchus contortus,* the rate of infection in sheep was (15.74%). Out of 381 small ruminants, 146 were goats, 63 out of 146 goats tested positive, the rate of infection in goat was 43.15% (Table 1) the Chi-square test was 19.635, the result showed that there was no significant association between *Haemonchus contortus* infection between sheep and goat of small ruminants (P-value =0.000). Out of 381 small ruminant 54 were young, 10 out of 54 young were tested positive with *Haemonchus contortus*, the rate of infection in young small ruminants was 18.5 %. Out of 381 small ruminants 327 were adult, 90 out of 327 were found positive with *Haemonchus contortus*, the rate of infection in adult was 27.5% (Table 2). The Chi-square test was 01.196, there was significant association between *Haemonchus contortus* infection and age of animal (P-value =0.274). Out of 381 small ruminants 113 were male, 21 out of 113 were found positive, the rate of infection in male was 18.58%. Out of 381 small ruminants examined 268 were female, 79 out of 381 were tested positive, the rate of infection in female was 29.4% (Table 3). The Chi-square test was 2.955, there was significant association between *Haemonchus contortus* infection and sex of animal (P-value =0.086).

The Table 1 presents the prevalence of *Haemonchus contortus* in small ruminants (sheep and goats), along with the results of a Chi-square test.

Table 1. Prevalence of *Haemonchus contortus* in small ruminants (sheep and goat)

Small ruminants	No. examined samples	No. positives	Prevalence (%)	Chi-square	p-value
Sheep	235	37	15.74%	19.635	0.000
Goat	146	63	43.15%		
Total	381	100	26.24%		

Table 2. Prevalence of *Haemonchus contortus* base on age of sheep and goat

Age group	No. examined samples	No. positive	Prevalence (%)	Chi-square	p-value
Young	54	10	18.5%	1.196	0.274
Adult	327	90	27.5%		
Total	381	100	26.24%		

Table 3. Prevalence of *Haemonchus contortus* based on sex of sheep and goat

Sex	No. examined samples	No. positive	Prevalence (%)	Chi-square	p-value
Male	113	21	18.58%	2.955	0.086
Female	268	79	29.4%		
Total	381	100	26.24%		

4. DISCUSSION

"Gastrointestinal parasites infection is a worldwide problem for both small and large scale farmers. Infection by gastrointestinal parasites especially *Haemonchus contortus* in ruminants including sheep and goats it can result to severe loses. Economic losses are caused by gastrointestinal parasites in a variety of ways. They cause loses through infertility, reduced work capacity, a reduction in food intake and lower weight gains, treatment costs, and mortality in heavily parasitized animals" [6].

"This study was aimed at evaluating the current prevalence of *Haemonchus contortus* of small ruminants slaughtered at Talata Mafara central abattoir, Zamfara State, Northern Nigeria. The occurrence of *Haemonchus contortus* in the study area are influenced by a multi-factorial system, which comprises hosts, parasite and environmental factors. The results of this study indicated that *Haemonchus contortus* is spread in small ruminants slaughtered at Talata Mafara Central abattoir. Therefore the overall prevalence of *Haemonchus contortus* was 28.17%. This prevalence is lower than the prevalence reported in Zuru Emirate of kebbi State that record 54.8% prevalence of *Haemonchus contortus* in small ruminants" [6]. "Also the prevalence of *haemonchosis* in this study is lower than the prevalence in the other studies in different countries which was 47.67% in Ethiopia [13], 55.56% in Benin" [14], 37.18 % in Pakistan [15], and 35.44% also in Pakistan [3]. And also lower than the prevalence reported in abattoir of Tulus locality in South Darfur State which was 53.4% [16]. This present study is not surprising considering the fact that the epidemiology of gastrointestinal helminths varies in different localities, depending on the local climate, season and management practices.

The prevalence of *Haemonchus contortus* in related to small ruminants was high in goats than in sheep. Sheep and goats are victim of *haemonchosis* in the study areas. Goats browse on shrubs and small trees where translation of infective larvae to such a height seems to be impossible. However, it is similar to reports Biu et al. [17] who reported higher prevalence rate in goats. Immune antibodies in sheep enabled it to throw off its worm burden and also prevented further infection by immobilizing the larvae in the gastrointestinal mucosa [7].

"Adult small ruminants were highly infected as compared to young ones of small ruminants. The higher infection in adult animals may be attributed to lesser resistance because of exposure time to *Haemonchus contortus* in pastures compared with the young small ruminants. These results are in agreement with the studies carried out in Pakistan" [18].

"Also higher prevalence of infection was in females compared to male of small ruminants. This result supports the general fact that female animals are susceptible to helminthes infections which is attributed to differences in sex hormones especially during the lactation period due to a decrease in immune status" [6]. "These findings were similar to the reports" of Keyyu et al. [19]; Regassa et al. [20] and Ghanem et al. [21]. This also agrees with the reports of Dagnachew et al. [13] "who reported a higher prevalence rate of helminth infection in females". This may be attributed to the immunosuppressive effect of reproductive hormones of the female animals especially during pregnancy and peri-parturient periodand Raza et al. [15] documented higher prevalence of helminth infection in rams than in females [7,22-23].

5. CONCLUSION

Haemonchus contortus is prevalent in Talata Mafara Central Abattoir, Zamfara State Nigeria, the infection rate was high in goats than in sheep, female are more infected than the male with significant association. Also adult small ruminants are more susceptible than the young. Sheep and goats are victim of *haemonchosis* in the study areas. Majorityof the small ruminants suffer from chronic *haemonchosis* which lead to anaemia, poor weight gain, emaciation and mortality that lead to great economic losses to farmers.

6. RECOMMENDATIONS

Educating the farmers with regards to the epidemiology of *Haemonchus contortus* should be raised in order to reduce the prevalence of the infection. Government should made veterinary services readily available and accessible to the farmers, which will facilitate quick access to information and veterinary services. Also Farmers should improve their management and grazing systems to avoid risk factors such as, free-range farming and overcrowding at farms.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

ETHICAL APPROVAL

Before the commencement of the study, a permission and approval from the research ethic committee and Zamfara State Ministry of Agriculture and Natural Resources were obtained so as to have better access to the abattoir and ensure consent and confidentiality of the abattoir's head and butchers for the study.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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