



PREVALENCE OF GASTROINTESTINAL NEMATODES AND ITS ASSOCIATED RISK FACTORS IN SHEEP KEPT IN WUKARI TOWN TARABA STATE NIGERIA

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ABSTRACT

The study was conducted to determine the prevalence of gastrointestinal nematodes and its associated risk factors in sheep kept at Wukari town, Taraba State Nigeria. Coprological diagnostic technique was adopted for the study. A total of 400 faecal samples were examined for nematode parasites eggs for a period of three months, and 286 out of them had eggs of different nematode parasites with overall prevalence of 71.5%. Infection was either single or mixed. Single infection was more prevalent (68.3%) than mixed infection (3.3%). Three gastrointestinal nematode parasites of veterinary importance were identified. *Strongyles* had the highest prevalence (49.3%), followed by *Trichuris Ovis* (13%) and least *Strongyloides Papillosus* (6%). Prevalence was observed to be significantly higher ($P < 0.05$) in female sheep (76.8%) than the male (56.3%). Age-based prevalence revealed that young sheep had the highest (74.4%) while adults had 70.5% but was not statistically significant ($P > 0.05$). Sheep in poor body condition had the prevalence of 94.5% while those in medium and good body condition had the prevalence of 66.2% and 28.3% respectively. Prevalence was significantly ($P < 0.05$) higher in sheep with poor body condition. It was concluded that gastrointestinal nematodes is prevalent in the study area; sex and body condition score were potential risk factors associated with prevalence of the infection in the study area. Therefore, gastrointestinal parasites control through timely de-worming with broad spectrum anti-helminthics should be encouraged to improve productivity.

Keywords: Nematodes, Prevalence, Sheep, Parasites, Infection

INTRODUCTION

Small ruminants production in Nigeria is considered as a lucrative investment that contribute greatly to the socio-economic livelihood of many household; they are good source of income generation, household consumption and as security in crop failure (Lebbie, 2014). Despite the large livestock production in Nigeria, the economic benefits remain minor due to prevailing diseases including parasitic diseases, poor nutrition, poor management and lack of veterinary care (Tibbo *et al.*, 2013). Parasites of veterinary importance are global problem and are known to deteriorate the wellbeing of host animals by robbing them the essential nutrients that are required for optimum reproduction and productivity (Nwosu, 2007). Among these parasites, helminthes such as Nematodes (Round worms), Cestode (Tapeworms) and Trematodes (Flukes) are known to be a major constraint to ruminant's well-being and productive performance (Hesterberg *et al.*, 2007). Gastrointestinal nematodes (GIN) is well spread in Nigeria and a major challenge in small ruminants production; they limit production output, increased production costs, and pose zoonotic risks (Asmare *et al.*, 2016). Livestock farmers may not easily detect the effect of these helminthes on the productive performance of their animal because of the subclinical nature of the infections and once it's clinically noticed, such economic losses in terms of animal productivity have already occurred (Kaplan, 2006). Gastrointestinal parasitism is a multi-etiological disease; however, the GIN responsible



for sheep poor productive performance and mortality belongs mainly to the order Strongylida, superfamily Strongyloidea (Zajac and Garza, 2020). Among these nematodes, the genera *Haemonchus*, *Trichostrongylus*, *Teladorsagia* (Ostertagia), and *Oesophagostomum* are the most frequent (Herrera *et al.*, 2013). Other GIN belonging to different taxonomic orders that commonly parasitize sheep include *Strongyloides*, and *Trichuris*; (Zajac and Garza, 2020). Infection usually occurs primarily through contaminated feed and water, enhanced by poor hygiene and can be associated with several factors such as animal's age, sex, breed, parasite species involved, and degree of parasitic infection (Williams *et al.*, 2021). Clinical diagnosis of GIN is difficult, since the signs are not pathognomonic. However, diagnosis plays a major role in investigating parasite epidemiology. The antemortem diagnosis of nematode infections in livestock has been based on the detection of nematode eggs or larvae in the faeces by microscopic examination using the methods of flotation and/or larval culture (Gasser, 2013). Anti-helminthics is been used for long to combat the effect of gastrointestinal parasitism but frequent use of these anti-helminthics over many years has inexorably led to the increase of drugs resistance by many helminthes (Singh, 2015). Although considerable work has been done on gastrointestinal parasites of small ruminants in many parts of Nigeria, there is paucity of published reports on prevalence and intensity of the gastrointestinal nematodes in sheep kept in Wukari town despite large population of small ruminants. Therefore, the study was conducted to determine the prevalence of gastrointestinal nematodes and associated risk factors such as age, sex and body condition scores in the study area.

MATERIALS AND METHOD

Study Area

The study was conducted in Wukari town. Wukari is the headquarters of Wukari Local Government Area of Taraba State. It's situated in the North Eastern Nigeria which lies within latitude 70.52'; 48'N to 70.87' N and a longitude 90.43' 38''E to 90.77''E at an elevation of 189 meters above sea level (Elechi *et al.*, 2013). The town has an estimated population of 241,546 in 2006 population census (NPC, 2006). Taraba State has a tropical climate, marked with two distinct seasons; wet season which starts in March and ends in October and dry season which starts in November and ends in March or April (Taraba State Diary, 2018).

Study Animal/ Population/Data Collection

The study animals were local breed of sheep kept in Wukari town. A total of 400 sheep were sampled for this study. Age, sex, and body condition score were considered as risk factors for the occurrence of gastrointestinal nematode infections in sheep. The sheep were grouped into two age groups; young (≤ 1 year) and adult (>1 year) according to the classification of age groups by (Kumsa *et al.*, 2011). Age was determined through estimation of dentition by looking at the appearance of the permanent incisor. On the other hand, the female sheep among them were identified by the presence of prominent vulva at the perineal area and udder located at the inguinal area. The presence of the male organ (scrotal sac) located at the inguinal area was used in the identification of the males. Body condition scoring of sampled animals was carried out according to the method described by Nazhat *et al.* (2021) and categorized into three scores as poor, medium and good. The poor body condition was recorded when individual spinous process were sharp to touch and easily distinguished, in addition, the bony structure of the sheep were easily noticeable. The eye muscles have moderate depth. Medium body condition was recorded when the spinous process examined with very firm pressure and they were round rather than sharp. The eye muscle areas were full with moderate fat cover. Good body condition was recorded when the top and side of the back bone in loin area immediately behind the last



rib and above the kidney were covered with muscles. The eye muscles were full and had a thick fat cover.

Study Design, Sample Size and Sampling Technique

A cross sectional study was used to determine the prevalence of gastrointestinal nematodes in sheep from May-August, 2023 based on Coprological diagnostic technique (Faecal examination). Since there is no reasonable research done on this topic in the study area so far, the sample size was determined using Thrusfield formula ($N = \frac{Z^2 P (1-P)}{d^2}$) by considering 50% expected prevalence (P), 95% confidence interval (CI) ($Z = 1.96$) with 5% desired absolute precision (d) (Thrusfield, 2007). Although, the required sample size obtained by this formula was 384, but 400 sheep were randomly sampled to increase the precision. All procedures involving the research in animals were approved by the Ethical Committee for Animal Research of Federal University Wukari Taraba State (Ref No: CAR/FUW/EL/040).

Sample Collection and Examination Procedure

A fresh faecal sample of approximately 5 gram was collected directly from the rectum of 400 sheep by using rubber gloved fingers. Collected fecal samples were put in the sampling bottle containing 10% formalin and all the necessary information including body condition, sex, and age were labeled. The samples were transported on ice pack to the Microbiology and Parasitology Laboratory of College of Agriculture, Science and Technology, Jalingo for processing and examination of nematodes eggs. In laboratory, fecal samples were examined for nematode eggs using standard procedures of simple flotation technique as described by Urquhart *et al.* (2006). In this study, the floatation solution used was NaCl (sodium chloride). The nematodes eggs were identified according to Cheesbrough, (2006).

Data Analysis

The data of positive samples were expressed in simple percentages and presented on tables. The prevalence was calculated by dividing the number of positive animals by the total number of animals examined and times 100. Chi-square (χ^2) was used to test the existence of differences in prevalence between age groups, sex, and body condition. In all the analyses, confidence level was held at 95% and $P < 0.05$ was set for significance.

RESULTS AND DISCUSSION

An overall prevalence of 71.5% was obtained in this study (**Table 1**). This is higher than 60.4% reported in Maiduguri (Alade and Bwala 2015) and 51% reported in Bauchi (Inuwa *et al.* 2021). In contrast, result of this findings is lower than 91.3% and 76.1% reported by Tefera *et al.* (2011) and Ayele, (2014) respectively. The high prevalence in this study could be attributed to predisposing factors such as poor veterinary care, poor management such as overstocking of the sheep in a pen and frequent grazing of contaminated pasture. The marked difference in prevalence rates above may be due to differences in sample size, poor management, poor nutrition, agro-climatic condition that could support prolonged survival and development of infective larval stage of most nematodes (Rossango and Grunder, 2015). Three gastrointestinal nematodes of veterinary importance were encountered; 197 (49.3%) were positive for *strongyle-type* eggs, 52 (13%) were positive for *Trichuris ovis* eggs, and 24 (6%) were positive for *strongyloides papillosus* eggs. *Strongyle-type* eggs was more prevalent compared to others, and this concord with the report of Singh *et al.* (2015), Inuwa *et al.* (2021) and Zvinorova *et al.* (2016) but disagree with the report of Usman *et al.* (2023). The high prevalence for *Strongyle*-like eggs may be due to the fact that numerous nematodes parasites produced *strongyle*-like eggs which can only be identified on larval stage by fecal culture. Mixed infections were observed in 13 positive sheep as; *Strongyle-type* and *Trichuris ovis* 9 (2.3%), *Strongyle-type* and *Strongyloides papillosus* 4 (6%). Most of the samples were found with



single infections (68. 3%) than mixed infections (3. 3%). This disagree with the findings of Win *et al.* (2020) who reported higher prevalence of mixed infection and attributed the reason to the grazing of the animal together on a contaminated pasture and overstocking of the sheep in a pen.

Table 1: Prevalence of Nematode Parasites of Sheep Based on Species of Nematodes

Total Number Examined		Species of Nematode	Number Positive (%)
		Single Infection	
400		<i>Strongyle-like</i> eggs	197 (49. 3)
		<i>Trichuris ovis</i>	52 (13)
		<i>Strongyloides papillosus</i>	24 (6)
Subtotal			273 (68. 3)
		Mixed Infection	
		<i>Strongyle-type</i> and <i>Trichuris ovis</i>	9 (2. 3)
		<i>Strongyle-type</i> and <i>stongyloides papillosus</i>	4 (1)
Subtotal			13 (3. 3)
Grand total			286 (71. 5)

Prevalence based on risk factors is shown in **Table 2**. Sex-based prevalence showed that 228 (76. 8%) female sheep had GIN eggs and was significantly ($P < 0. 05$) higher than the 58 (56. 3%) obtained in male sheep. This agrees with the report of Usman *et al.* (2023)) in Biu Borno State. This could be due to an increase in parasites load during pregnancy and post-parturient period as a result of reduced immunity. It has been stated that female animals are prone to parasitism during pregnancy and post parturient period due to stress and decreased immunity status (Urquart 2006). This finding differs from the report of Lemma and Abera, (2013) and Ayele *et al.* (2014) who found out that both sexes were equally infected and this was attributed to equal exposure of both sexes to the same grazing pasture and being from similar agro-economy. Another contrasting report was expressed by Tesfalem, (2016) who stated that male sheep had higher prevalence than the female and attributed reason to better management and treatment of the female animals during pregnancy and lactation.

Prevalence based on age revealed that 81(74. 3%) out of the 109 young sheep had eggs of nematode parasites while 205(70. 5%) out of the 291 adult sheep were positive. Prevalence was slightly higher in young sheep than the adults. However, Chi-square test value indicated that there was no significant difference ($P > 0. 05$) in prevalence of gastrointestinal nematode infection of sheep and age groups. The observed higher prevalence in young sheep than the adults agree with the reports of Degnachew *et al.* (2011) but disagree with the reports of Hassan *et al.* (2011) and Kulisic *et al.* (2013). The higher prevalence in young sheep could be linked to weaker immune response in young animals (Raza *et al.*, 2007). Also adult animals develop acquired immunity against nematode infection as they get mature due to repeated exposure and this will help expel the parasite before it establishes itself in gastrointestinal tract which might reduce the infection rate (Degnachew *et al.*, 2011).In contrast, Bikila *et al.* (2013) observed that there was no difference in the prevalence between age groups and attributed this to equal exposure of the animals to the same grazing pasture and that even if the lamb graze less contaminated pasture, they might get infected from contaminated pasture being spread for the dams.

Sheep in poor body condition had the prevalence of 94. 5% while those in medium and good body condition had the prevalence of 66.2% and 28.3% respectively.Prevalence was

significantly higher in sheep with poor body condition. This agrees with Jejawa *et al.* (2014). Animal in poor body condition may have weak immunity which does not fight infections to the same extent as animal with healthy immune system (Kuchai *et al.*, 2011). This poor body condition could result from undernourishment or other coexisting diseases which may lead to poor immunological response to infective stage of the parasites. Well-fed animals develop good immunity that suppresses the fecundity of the parasites (Bisset *et al.*, 2016).

Table 2: Prevalence of Nematode Parasites Based on Risk Factors

Risk factors	Number Examined	Number positive (%)	X ²	P-value
Sex				
Male	103	58 (56.3)	15.706	0.000074
Female	297	228 (76.8)		
Age				
Adult	291	205 (70.5)	0.5814	0.445777
Young	109	81 (74.3)		
Body condition				
Good	53	15 (28.3)	84.252	0.00001
Medium	201	133 (66.2)		
Poor	146	138 (94.5)		

CONCLUSION AND RECOMMENDATIONS

The result of this study shows that gastrointestinal nematodes infection is present in the study area. Sex, age and body score condition were potential risk factors associated with prevalence of gastrointestinal nematode infection in the study area. Although age was statistically not significant, but younger sheep were slightly more prevalent than the adults. Therefore based on the above conclusion, the following are recommended; The parasites detected as *Strongyle-type* should be identified at genus and species level using further laboratory techniques. Predisposing factors such as poor veterinary care, poor management and concurrent chronic diseases should be avoided. There should be strategic anti-helminthic treatments of sheep with broad spectrum anti-helminthes quarterly in a year to reduce the parasites load and minimize pasture contamination with larvae.

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