Journal of Animal and Veterinary Sciences
2020; 7(3): 13-18
http://www.openscienceonline.com/journal/javs

Gastrointestinal Helminths Infections in Small Ruminants Slaughtered in Minna Modern Abattoir, North Central, Nigeria

Eke Samuel Sunday[1, *], Nwokocha Favour Amarachi[2], Omalu Innocent Chukwuemeka James[3], Otuu Chidiebere Agha[4], Onojafe Joseph Oghenebukome[5], Udeh Emmanuel Ochigbo[6], Kamaldeen Ismail Kolawole[3]

[1]Department of Biology, Faculty of Science, Air Force Institute of Technology, Kawo, Nigeria

[2]Department of Biology, Faculty of Science, Admiralty University of Nigeria, Ibusa, Nigeria

[3]Department of Animal Biology, School of Life Sciences, Federal University of Technology, Minna, Nigeria

[4]Department of Zoology and Environmental Biology, University of Nigeria, Nsukka, Nigeria

[5]Department of Animal and Environmental Biology, Delta State University, Abraka, Delta State, Nigeria

[6]Centre for Integrated Health Programs, Wuse 2, FCT Abuja, Nigeria

Email address

ekesamuel2012@gmail.com (E. S. Sunday)

[*]Corresponding author

To cite this article

Eke Samuel Sunday, Nwokocha Favour Amarachi, Omalu Innocent Chukwuemeka James, Otuu Chidiebere Agha, Onojafe Joseph Oghenebukome, Udeh Emmanuel Ochigbo, Kamaldeen Ismail Kolawole. Gastrointestinal Helminths Infections in Small Ruminants Slaughtered in Minna Modern Abattoir, North Central, Nigeria. *Journal of Animal and Veterinary Sciences.* Vol. 7, No. 3, 2020, pp. 13-18.

Received: November 26, 2020; **Accepted**: December 9, 2020; **Published**: December 23, 2020

Abstract

Gastrointestinal helminths have been recognized as a major constraint to both small and large-scale small ruminants production in developing countries. This study was aimed at evaluating the current status of gastrointestinal parasitic helminths infections in Minna modern abattoir. Two hundred and thirty three (233) faecal samples were collected from 147 goats and 86 sheep respectively and were examined by simple flotation method. The overall prevalence of helminth eggs recorded was 183 (78.54%). Goats had higher prevalence of helminth eggs 119 (65.03%) than in Sheep 64 (34.97%). The difference in the two species of small ruminants was not statistically significant (p>0.05). Based on gender, the males had the highest infection 106 (57.92%) than their female counterparts 77 (42.08%) of gastrointestinal helminths. The results of this study also revealed that in sheep, adult animals were more frequently infected than the young animals with 49 (76.56%) and 15 (23.44%) respectively. Also, in goats, adult animals had the highest infection rate of 87 (73.11%) than the young animals 32 (26.98). There is no significant difference (p>0.05) on the infection rate in relation to sex and age. Considering the months of study, the overall prevalence of 80 (43.72%), 55 (30.05%) and 48 (26.23%) were recorded in the months of July, September and August respectively. The differences in infection rates were not statistically significant (p>0.05) even though the prevalence was higher in the month of July. This study also revealed the presence of seven (7) genera of helminths: *Haemonchus sp, Strongyloides sp, Fasciola sp, Trichostrongylus sp, Oesophagostomum sp, Trichuris sp and Moniezia sp* in sheep and goats. This study has revealed an all round helminth infections in small ruminants, which may impact negatively on their productivity, therefore, effective control measures should be put in place to combat the despicable effects of gastrointestinal helminths on small ruminants.

Keywords

Minna, Gastrointestinal, Helminths, Ruminants and Flotation

1. Introduction

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 realizable wealth of a rural household [1]. The world's total numbers of goats and sheep were 861.9 and 1078.2 million, respectively [2]. In Nigeria, the total numbers of goats and sheep were 53.8 and 33.9 million, respectively [2]. This constitutes 6.2% and 3.1% of the world total population of goats and sheep respectively [2]. Sheep and goats harbour a variety of gastrointestinal tract (GIT) parasites, many of which are shared by both species. Among these parasites, helminths such as nematodes (roundworms), cestodes (tapeworms), and trematodes (flukes) are the most important as they affect the growth as well as the production of the animals. Gastrointestinal nematodes of the *Trichostrongylidae* family are perhaps the most important parasites of small ruminants' world-wide, causing significant morbidity and loss of production [3]. Gastrointestinal nematodes of small ruminants are roundworms parasitizing the abomasum, small intestine and large intestine. Infection usually occurs primarily through contaminated feed and water, enhanced by poor hygiene.

Intestinal helminthosis has for many years been recognized as a major problem in livestock rearing [4]. Most goats infected have been shown to be asymptomatic or produce only mild symptoms, as a result of which infections are often overlooked till serious complication or chronic clinical signs occur. Gastrointestinal nematodes could be harmful to the infected animals and cause economic loss due to mortalities and reduced weight gain [5, 6]. Gastrointestinal nematodes also cause hypoproteinemia, impaired digestive efficiency and pathogenic complications such as anaemia, diarrhoea, oedema and recumbency which will lead to lowered productivity, retarded growth rate and even death of lambs [7, 8]. The loss through reduced productivity is related to reduction of food intake, stunted growth, reduced work capacity, cost of treatment and control of helminthosis [9, 10]. The severity of infections depends on the genera of helminth parasites involved, animal species, the number of infective stages on pasture, an alteration in host susceptibility, the introduction of susceptible stock into an infected environment, the introduction of infections into an environment, ineffective parasite removal from the host animals due to poor drug administration techniques, and local environmental conditions such as humidity, temperature, rainfall, vegetation and management practices [11-13].

Several studies carried out on gastrointestinal helminthosis of small ruminants in many African countries showed that the prevalence of the infections varies from place to place. Studies on seasonal incidence of GI helminthosis are carried out to find the time in which infection with infective larvae begins, rises to a peak and decline so that the treatment can be timed to prevent severe infection as well as reduce contamination of pastures with eggs and larvae. Comprehensive studies are required to know the level of GIT helminths in small ruminants in Minna modern abattoir, North Central Nigeria and factors contributing to their prevalence.

2. Materials and Methods

2.1. Study Area

This study was carried out in Minna, Niger State, Nigeria from July to September, 2019. The study location was Minna modern abattoir located at Tayi village, Bosso. The study area has a latitude and longitude of 9930" 99 30"0.8" N 632"46.74"E and the area is found at an attitude of 259.14m (820.21ft). The average annual temperature of the study area is 27.5°C. The least amount of rainfall occurs in January. Most of the precipitation in Minna falls in September, averaging 260mm. The temperature is highest on average in March at around 30.5°C August is the coldest month with temperature average of 25.3°C.

2.2. Study Design and Sample Size

A cross-sectional type of study was done. The sample size was calculated according to the formula given by Thrusfield (2005) by using 95% level of confidence and expected prevalence was 89.1% from previous study of Ajanusi and Chiezey[14] and desired absolute precision of 5%. Therefore, Two and thirty three hundred (233) samples were collected. One hundred and forty seven (147) samples collected from goats and Eighty six (86) samples were collected from sheep.

Faecal Samples Collection and Analysis

Faecal samples were collected directly from the rectum of the animals using clean disposable polythene gloves, as described by Pratt, [15]. These were taken to the laboratory, Department of Animal Biology, Federal University of Technology, Minna, and processed immediately. After simple flotation, all nematode eggs were identified using a combination of keys given by Foreyt [16]. The nematode eggs present were identified in general terms as strongylid eggs, except for the eggs of *Moniezia, Strongyloides* and *Trichuris species*.

2.3. Parasitological Examination

In Endoparasites, 5gm of each fresh faecal samples of each sheep and goats will be collected, smashed with glass rod, usingdirect wet mount, a drop of normal saline was placed at the center of a clean slide, with a pipette dispenser. With an applicator stick a small quantity of the smashed faecal matter was mixed with a drop of normal saline to form smear. This was covered with cover slip for some minutes and viewed under the microscope with X40 objective lens. The parasites observed were isolated into different vials for further identification [17].

2.4. Data Analysis

The data obtained were reduced to Tables and charts. The percentage Prevalence of parasite species was calculated as number of individuals of a host species infected with a particular parasite species divided by the number of host examined times 100. Chi- square was used to test for association between the presence of helminth eggs and variables like sex, age, species and months of the study period. Value of p< 0.05 was considered significant.

3. Results

3.1. Overall Prevalence of Gastrointestinal Helminth Eggs Encountered in Minna Modern Abattoir

A total of Two hundred and thirty three (233) faecal samples from 147 goats and 86 sheep were examined for the presence of helminth eggs. The overall prevalence of helminth eggs in small ruminants is shown in Table 1. The overall prevalence of helminth eggs recorded was 78.54%. Goats had higher prevalence of helminth eggs 119 (65.03%) than in Sheep 64 (34.97%). The difference in the two species of small ruminants was not statistically significant (p>0.05).

3.2. Prevalence of Gastrointestinal Helminths in Relation to Sex and Age of Small Ruminants in Minna Modern Abattoir

Gender and Age – wise prevalence of gastrointestinal helminths small ruminants were also observed. Based on gender, the males had the highest infection 106 (57.92%) than their female counterparts 77 (42.08%) of gastrointestinal helminths. There was no significant difference (p = 3.847) on the infection rate in relation to gender. The comparison of the frequency of infection between young and adult age groups of the animals showed that in sheep, adult animals were more frequently infected than the young animals with 49 (76.56%) and 15 (23.44%) respectively. Also, in goats, adult animals had the highest infection rate of 87 (73.11%) than the young animals with 32 (26.98) (Table 2). There is no significant difference (p = 3.847) on the infection rate in relation to age.

3.3. Prevalence of Gastrointestinal Helminths in relation to the months of the study period in Minna Modern Abattoir

Considering the months of study, the overall prevalence of 80 (43.72%), 55 (30.05%) and 48 (26.23%) were recorded in the month of July, September and August respectively. The difference in infection rates were not statistically significant (p>0.05) even though the prevalence was higher in the month of July (Table 3).

3.4. Prevalence of Egg Count of Helminths from Small Ruminants Slaughtered in Minna Modern Abattoir

The prevalence of egg count of helminths genera from small ruminants examined in Minna Modern Abattoir are shown in Table 4. Seven (7) different genera of parasitic helminths were recovered. These included *Haemonchus, Strongyloides, Fasciola, Trichostrongylus, Oesophagostomum, Trichuris and Moniezia*. Goats had prevalence of 26.70%, 19.81%, 15.32%, 12.84%, 9.73%, 41.50% and 28.10% for *Haemonchussp, Strongyloidessp, Fasciola sp, Trichostrongylus sp, Oesophagostomum sp, Trichuris sp and Moniezia sp* respectively while sheep had prevalence of 15.26%, 16.04%, 17.12%, 9.46%, 11.50%, 13.50% and 17.36% for *Haemonchus sp, Strongyloides sp, Fasciola sp, Trichostrongylus sp, Oesophagostomum sp, Trichuris sp and Moniezia sp* respectively. Considering the sex of small ruminants, male had prevalence of 19.62%, 12.26%, 25.23%, 31.76%, 21.24%, 22.0% and 22.31% for *Haemonchus sp, Strongyloides sp, Fasciola sp, Trichostrongylus sp, Oesophagostomum sp, Trichuris sp and Moniezia sp* respectively while female had prevalence of 11.72%, 4.72%, 18.92%, 12.84%, 23.01%, 8.0% and 6.61% for *Haemonchus sp, Strongyloides sp, Fasciola sp, Trichostrongylus sp, Oesophagostomum sp, Trichuris sp and Moniezia sp* respectively. In age, young animals had prevalence of 10.63%, 25.47%, 12.61%, 14.86%, 15.93%, 7.0% and 15.70% for *Haemonchus sp, Strongyloides sp, Fasciola sp, Trichostrongylus sp, Oesophagostomum sp, Trichuris sp and Moniezia sp* respectively while adult animals had prevalence of 16.08%, 21.70%, 10.81%, 18.24%, 18.58%, 8.0% and 9.92% for *Haemonchus sp, Strongyloides sp, Fasciola sp, Trichostrongylus sp, Oesophagostomum sp, Trichuris sp and Moniezia sp* respectively.

Table 1. *Overall prevalence of gastrointestinal helminths encountered in Minna Abattoir.*

Species	No. examined (%)	No. +ve (%)	X^2 – value	P – value
Goats	147 (63.09)	119 (65.03)	1.37	3.84
Sheep	86 (36.91)	64 (34.97)		
Total	233 (100)	183 (78.54)		

Table 2. *Gender and age Prevalence of Gastrointestinal Helminths of Sheep and Goats in Minna Abattoir.*

Parameters	Goat (n = 147)		Sheep (n = 86)		Total (n = 233)		X^2 – value	P – value
	No. examined (%)	No. +ve (%)	No. examined (%)	No. +ve (%)	No. examined (%)	No. +ve (%)		
Sex								
Male	83 (56.46)	71 (59.66)	52 (60.47)	35 (54.69)	135 (57.94)	106 (57.92)		
Female	64 (43.54)	48 (40.34)	34 (39.53)	29 (45.31)	98 (42.06)	77 (42.08)	0.73	3.84

Parameters	Goat (n = 147)		Sheep (n = 86)		Total (n = 233)		X^2 – value	P – value
	No. examined (%)	No. +ve (%)	No. examined (%)	No. +ve (%)	No. examined (%)	No. +ve (%)		
Total	147 (63.09)	119 (65.03)	86 (36.91)	64 (34.97)	233 (100)	183 (78.54)		
Age								
Young	45 (30.61)	32 (26.89)	25 (29.07)	15 (23.44)	70 (30.04)	47 (25.68)	0.26	3.84
Adult	102 (69.39)	87 (73.11)	61 (70.93)	49 (76.56)	163 (69.96)	136 (74.32)		
Total	147 (63.09)	119 (65.03)	86 (36.91)	64 (34.97)	233 (100)	183 (78.54)		

Table 3. *Monthly variation in the Distribution of Gastrointestinal Helminths.*

	Goat (n = 147)		Sheep (n = 86)		Total (n = 233)	
Months	No. examined (%)	No. +ve (%)	No. examined (%)	No. +ve (%)	No. examined (%)	No. +ve (%)
July	59 (40.14)	52 (43.70)	32 (37.21)	28 (43.75)	91 (39.06)	80 (43.72)
August	46 (31.29)	29 (24.37)	28 (32.56)	19 (29.69)	74 (31.76)	48 (26.23)
September	42 (28.57)	38 (31.93)	26 (30.23)	17 (26.56)	68 (29.18)	55 (30.05)
Total	147 (63.09)	119 (65.03)	86 (36.91)	64 (34.97)	233 (100)	183 (78.54)

X^2 Cal = 0.85; X^2 Tab = 5.99; df = 2

Table 4. *Prevalence of each species of Gastrointestinal Helminths ova in small Ruminants in relation to Species, Sex and Age Slaughtered in Minna Abattoir.*

Helminth sp	Goats (%)	Sheep (%)	Male (%)	Female (%)	Young (%)	Adult (%)	Total (%)
Haemonchus sp	98 (26.70)	56 (15.26)	72 (19.62)	43 (11.72)	39 (10.63)	59 (16.08)	367 (31.48)
Strogyloides sp	21 (19.81)	17 (16.04)	13 (12.26)	5 (4.72)	27 (25.47)	23 (21.70)	106 (9.10)
Fasciola sp	17 (15.32)	19 (17.12)	28 (25.23)	21 (18.92)	14 (12.61)	12 (10.81)	111 (9.52)
Trichostrongylus sp	19 (12.84)	14 (9.46)	47 (31.76)	19 (12.84)	22 (14.86)	27 (18.24)	148 (12.69)
Oesophagostomum sp	11 (9.73)	13 (11.50)	24 (21.24)	26 (23.01)	18 (15.93)	21 (18.58)	113 (9.69)
Trichuris sp	83 (41.50)	27 (13.50)	44 (22.0)	16 (8.0)	14 (7.0)	16 (8.0)	200 (17.15)
Moniezia sp	34 (28.10)	21 (17.36)	27 (22.31)	8 (6.61)	19 (15.70)	12 (9.92)	121 (10.38)
Total	283 (24.27)	167 (14.32)	255 (21.87)	138 (11.84)	153 (13.12)	170 (14.58)	(100)

X^2 Cal = 160.62; X^2 Tab = 43.77; df = 30

4. Discussion

Gastrointestinal helminths infection is a worldwide problem for both small and large scale farmers. Infection by gastrointestinal helminths in small ruminants including sheep and goats can result in severe loses. Economic losses caused by gastrointestinal helminths vary in so many 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 [18].

The result of the faecal examination during the study revealed an overall prevalence rate of helminths as 183 (78.54%) in small ruminants examined at Minna modern abattoir. The prevalence of gastrointestinal helminths infection among small ruminants showed that goats had the highest prevalence of infection 119 (65.03%) than sheep 64 (34.97%). These findings are higher than the results of other surveys in sheep and goat carried out in North-eastern Nigeria [19].

The high prevalence of these gastrointestinal helminths observed in goats is in agreement with the findings of Solomon-Wisdom *et al*. [13] and Nwigwe *et al*. [20] who in their independent studies reported that gastrointestinal parasitic helminths are more dominant in goats and are among the successful parasites of animals because of their sufficient life cycle ranging from the very simple to the extremely complicated stage. The high prevalence might be due to the system of management that these goats were subjected to as they were always left to wander about scavenging and feeding indiscriminately on anything they come in contact with and then return to their poorly kept sheds. These findings agree with the work of Forse [8] and Adejinmi *et al*. [21] who stated that animals are exposed to massive parasitic infections when they are kept in poor ranches/conditions and also when they are fed with contaminated food and water. Higher humidity and rainfall recorded in the study area could be another contributing factor to the high prevalence of gastrointestinal parasitic helminthes recorded in the study area. The prevalence however, agrees with previous reports from other geographical regions of Nigeria which ranged from 77 - 100% [11, 22-24].

The study revealed that the gender (sex) of the animal did not show any significant difference in prevalence, even though the rate was higher in males. Adua and Hassan [25] reported that gender does not really have direct influence on the epidemiology and distribution of gastrointestinal parasites among sheep and goats. The absence of gender difference in infection is also consistent with other reports [1, 26-28]. This agrees with the report of Eke *et al*. [29] who reported a higher prevalence of gastrointestinal parasites among small ruminants in Minna. This disagrees with the reports of Dagnachew *et al*. [30] who reported a higher prevalence rate of helminth infection in females.

In respect to age of the animals studied, adults recorded the highest number of gastrointestinal helminth parasitic infection 136 (74.32%). This finding agrees with the reports of Nwosu *et al*. [19] and Ntonifor *et al*. [31] which clearly showed that adult animals could have been harbouring matured worms. Age was considered an important risk factor in gastrointestinal helminthosis. Several authors have documented that adult animals are more pruned to infection

[12, 32] as they mature due to repeated exposure [30].

The relative proportion of each of the seven genera recovered in this study is similar to the reports of Fakae [33] and Gadahi *et al*. [34], who suggests that *Haemonchus* is the predominant helminth of small ruminants in the country. It has been suggested that *Haemonchus* can acquire resistance to environmental factors faster than other gastrointestinal nematodes, like *Trichostrongylus*, because of its high biotic potential [35]. This probably accounted for its high prevalence and total worm burden in this study. The helminth egg types recovered in this study were *Haemonchus, Strongyloides, Fasciola, Trichostrongylus, Oesophagostomum, Trichuris and Moniezia*. The result showed that *Trichuris* egg was the most prevalent with prevalence rate of 83 (41.50%) in goats *Moniezia* egg was higher in sheep 21 (17.36%). This result agrees with previous report from other geographical regions in Nigeria [11, 22] and in Ethiopia [36].

5. Conclusion

This study established the overall prevalence rate of helminth infection through faecal examinations to be (78.54%) in small ruminants. Goats had higher prevalence of helminth eggs (65.03%) than in Sheep. Seven (7) helminths genera were recovered at faecal examinations namely, *Haemonchus sp, Strongyloides sp, Fasciola sp, Trichostrongylus sp, Oesophagostomum sp, Trichuris sp and Moniezia sp* in sheep and goats. Of these helminths, *Haemonchus sp* was recorded the highest prevalence (31.48%) than other genera encountered during the study.

Gender and Age – wise prevalence of gastrointestinal helminthes small ruminants showed that males had higher infection (57.92%) than their female counterparts (42.08%) of gastrointestinal helminths. The comparison of the frequency of infection between young and adult age groups of the animals showed that in goats, adult animals were more frequently infected than the young animals with (76.56%) and 15 (23.44%) respectively while in sheep, adult animals had the highest infection rate of (73.11%) than the young animals (26.98). On monthly variation, the highest number of gastrointestinal helminths was recorded in the month of July (43.72%).

This study has therefore, confirmed that helminthosis, especially haemonchosis is a threat to small ruminants in the study area. Based on these observations, this study has highlighted the urgent need for the development of epidemiologically-based control strategies for control of helminth parasites of small ruminants in this area.

6. Recommendations

Based on the above conclusion, the following recommendations were made:

Strategic deworming of animals, when conditions are most favourable for larval development on the pasture, using broad spectrum anthelmintics since polyparasitism is a common problem.

Education and awareness creation for farmers with regards to the epidemiology of parasitic diseases. They should be taught the best parasite control strategy and management practices through extension.

Provision of animal health extension services, which includes regular monitoring of faecal egg output of selected animals, assessment of anaemia and treatment of animals based on the outcome of these analyses.

References

[1] Hassan, D. I., Musa-Azara, I. S. Mohammed, J., & Zanwa, I. A. (2013b). Influence of age, sex and season on haematology and serum chemistry of Red Sokoto goats in Lafia, Nasarawa State Nigeria. *International Journal of Agricultural Science and Veterinary Medicine,* 1 (4), 57-63.

[2] FAOSTAT (2008): http://faostat.fao.org/default.aspx FECPAK, (2001a). Tapeworms - Are they really a problem? *FECPAK Update 1 (8):* pp4.

[3] Tariq, K. A. Chishti, M. Z., & Ahmad, F.(2010). Gastrointestinal nematode infections in goats relative to season. host sex and age from the Kashmir valley. India. *Journal of Helminthology*. 84, 93– 97.

[4] Okaiyeto S. O., Salami O. S., Dnbirni S. A., Allam L., &Onoja, I. I. (2012). Clinical, Gross and Histopathological Changes Associated With Chronic Fasciolosis Infection in a Dairy Farm. *Journal of veterinary advances*, 2 (8), 444-448.

[5] Vlassoff, A., Leathwick, D. M., & Health, A. C. G. (2001). The epidemiology of nematode infections of sheep, *New Zeland Veterinary Journal,* 49, 213-221.

[6] Menkir, M. S., Arvid, U., & Peter, J. W. (2007). Epidemiology and seasonal dynamics of gastrointestinal nematode infections of sheep in a semi-arid region of eastern Ethiopia. *Veterinary Parasitology*. 143, 311-321.

[7] Sykes, A. R. (1994). Parasitism and production in farm ruminants. *Animal production journal*, 59, 155-172.

[8] Forse, A. M. (1999). *Where there is no vet. 1st ed.* Macmillian press Ltd, London and Oxford publisher. Pp. 380.

[9] Odoie, A., Gathuma, J. M., Gachuiri, C. K., &Omore, A. (2007). Risk factors of gastrointestinal nematode parasite infections in small ruminants kept in smallholder mixed farms in Kenya. *Biomed Central Veterinary Resource*, 3 (6), 1186-1746.

[10] Chaudhary, F. R., Khan, M. F. U., & Qayyum, M. (2007). Prevalence of *Haemonchuscontortu s*in naturally infected small ruminants grazing in the Photohar area of Pakistan. *Pakistan Veterinary Journal,* 27 (2), 73-79.

[11] Nwosu, C. O., Ogunrinade, A. F., &Fagbemi, B. O. (1996a). The seasonal prevalence of *Haemonchus species* in Red Sokoto (maradi) goats in Nigeria. *Veterinary Research Communications,* 20, 367-370.

[12] Urquhart, G. M., Armour, J., Duncan, J. L., Dunn A. M., & Jennings, F. W. (1996). *Veterinary Parasitology,* 2nd edition Blackwell Science, Pp. 213-356.

[13] Solomon-Wisdom, G. O., Matur, B. M., &Ibe, K. C. (2014). Prevalence of intestinal helminth infection among sheep and goats raised for slaughtering in Gwagwalada Abattoir, Abuja, Nigeria. *Journal of Global Pharmaceutical Sciences,* 2 (1), 12-19.

[14] Ajanusi, O. J., &Chiezey, N. P. (2005). *Haemonchuscontortu s*and some *haemosporozoan* infections in goats in Zaria. *Nigerian Journal of Parasitology,* 26, 13-17.

[15] Oyerinde, J. P. O. (1999). *Essential of Tropical Medical Parasitology*. University of Lagos press, Akoka, Lagos, Nigeria. Pp. 347-358.

[16] Foreyt, W. J. (2001). Veterinary Parasitology Reference Manual, 5th. Edition. Blackwell Publishers, Iowa, Pp. 137-150.

[17] Cheesbrough, M. (2005). District Laboratory Practice for Tropical Countries. Part 2. Cambridge University Press, UK. p. 434.

[18] Waller, P. J. (2006). From discovery to development: current industry perspectives for the development of novel methods of helminth control in livestock. *Veterinary Parasitology*, 139 (1-3), 1-14.

[19] Nwosu, C. O., Madu, P. P., & Richards, W. S. (2007). Prevalence and seasonal changes in the population of gastrointestinal nematodes of small ruminants in the semi-arid zone of north-eastern Nigeria. *Veterinary Parasitology*, 144 (1-2), 118-124.

[20] Nwigwe, J. O., Njoku, O. O., Odikamnoro, O. O., &Uhuo, A. C. (2013). Comparative study of intestinal helminths and protozoa of cattle and goats in Abakaliki metropolis of Ebonyi State, Nigeria. *Advances in Applied Science Research,* 4 (2), 223-227.

[21] Adejinmi, O. O., Adejinmi, J. O., Falohun, O. O., Aderoju, O. R., &Dauda, W. J. (2015). Prevalence of Gastrointestinal Parasites of Goats in Ibadan, Southwest, Nigeria. *World Journal of Agricultural Research,* 3 (2), 49-51.

[22] Nwosu, C. O., Ogunrinde, A. F., &fagbemi, B. O. (1996b). Prevalence and seasonal changes in the gastro-intestinal helminths of Nigeria goats. *Journal of Helminthology*, 70, 329-333.

[23] Okaiyeto, S. O., Tekdek, L. B., Sackey, A. K. B., &Ajanusi, O. J. (2008). Prevalence of haemo and gastrointestinal parasites in sheep and goats kept by the NormadicFulanis in some Northern states of Nigeria. *Research Journal of Animal Science*, 2 (2), 31-33.

[24] Jatau, I. D., Abdulganiyu, A., Lawal, A. I., Okubanjo, O. O., &Yusufu, K. H. (2011). Gastrointestinal and haemoparasitism of sheep and goats at slaughter in Kano, northern-Nigeria. *Sokoto Journal of Veterinary Sciences*, 9 (1), 7-11

[25] Adua, M. M., & Hassan, D. I. (2016). Prevalence of Nematode Infestation in Goats reared in Nasarawa State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment,* 12 (3), 79-84

[26] Keyyu, J. D., Kassuku, A. A., Kyvsgaard, N. C., & Willingham, A. L. (2003). Gastrointestinal nematodes in indigenous zebu cattle under pastoral and nomadic management systems in the lower plains of southern highlands of Tanzania. *Veterinary Resources Communication*, 27 (5), 371-380.

[27] Regassa, F., Sori, T., Dhuguma, R., &Kiros, Y. (2006). Epidemiology of gastrointestinal parasites of ruminants in Western Oromia, Ethiopia. *Journal of Applied Research in Veterinary Medicine*, 4 (1), 51.

[28] Ghanem, Y. M., Naser, M. H., Abdelkader, A. H., &Heybe, A. (2009). An epidemiocoprological study of protozoan and nematode parasites of ruminants in tropical semi-arid district of Somalilan D (North of Somalia). *Veterinary Medical Journal,* Pp. 768-787.

[29] Eke, S. S., Omalu, I. C. J., Ochaguba, J. E., Urama, A. C., Hassan, S. C., Otuu, C. A. and Okafor, I. D. (2019). Prevalence of gastrointestinal parasites of sheep and goats slaughtered in Minna Modern Abattoir, Niger State, Nigeria. Journal of Animal Science and Veterinary Medicine, 4 (2), 65 – 70.

[30] Dagnachew, S., Amamute, A., &Temesgen, W. (2011). Epidemiology of gastrointestinal helminthiasis of small ruminants in selected sites of North Gondar zone, Northwest Ethiopia. *Ethiopia Veterinary Journal,* 15, 57-68.

[31] Ntonifor, H. N., Shei S. J., Ndale, N. W., &Mbunkur, G. N. (2013). Epidemiological studies of parasitic infections in ruminants in Jakiri, Bui Division, North-West Region of Cameroon. *Journals of Veterinary Medicine and Animal Health*, 5 (12), 344-352.

[32] Taswar, Z., Ahmad, S., Lashari, M. H., & Hayat, C. S. (2010). Prevalence of *Haemonchuscontortus*in sheep at Research Centre for Conservation of Sahiwal Cattle (RCCSC) Jehangirabad, District Khanewal Punjab, Pakistan. *Pakistan Journal of Zoology*, 42, 735-739.

[33] Fakae, B. B. (1990b). Seasonal changes and hypobiosis in *Haemonchuscontortus*infection in the West African Dwarf sheep and goats in the Nigerian derived savanna. *Veterinary Parasitology,* 36, 123- 130

[34] Gadahi, J. A., Arshed, M. J., Ali, Q., Javaid, S. B., & Shah, S. I. (2009). Prevalence of gastrointestinal parasites of sheep and goat in and around Rawalpindi and Islamabad. *Pakistan Veterinary World,* 2 (2), 51-53.

[35] Torres-Acosta, J. F. J., Dzul-Canche. U., Caballero, A. J. A., &Vivas, R. I. R. (2003). Prevalence of benzimidazole resistant nematodes in sheep flocks in Yucatan, Mexico. *Veterinary Parasitology*, 114, 33–42.

[36] Tesfaheywet, Z. (2012). Helminthosis of sheep and goats in and around Haramaya, Southeastern Ethiopia. *Journal of Veterinary Medicine and Animal Health,* 4 (3), 48-55.