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EPIDEMIOLOGY OF GASTROINTESTINAL HELMINTHES OF SHEEP AND GOATS IN SULEJA LOCAL GOVERNMENT AREA OF NIGER STATE, NORTH CENTRAL, NIGERIA

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ABSTRACT

A cross sectional study was carried out to determine the prevalence of Gastrointestinal Helminthes of Small Ruminants in Suleja Local Government Area of Niger State, Nigeria. A total of 400 faecal samples were collected from 194 Sheep and 206 goats and analyzed using centrifugal floatation and formol ether concentration technique. An overall prevalence of 48% was recorded. Goats (51.94) were more infected than Sheep (43.81%) and the difference was insignificant (P>0.05). Sheep had the highest parasitic load of 100 and 1300 epg than Goats. Seven gastrointestinal helminthes were identified in the study namely: Strongyle spp (12.5%), Toxocara spp (12.75%), Strongyloides spp (14.75%), Taenia spp (4.25%), Monieza spp (2.25%), Fasciola spp (0.5%) and Schistosoma spp (1.25%) with Strongyloides spp having the highest prevalence (14.75%) while Fasciola spp (0.5%) had the least prevalence. The study shows that female (48.74%) and adult sheep (45.07%) were more infected than male (36%) and young sheep (40.38%) and the difference was non-significant (P>0.05). Yankasa (60.97%) and non-pregnant Sheep (64.06%) were more infected than uda (26.63%) and pregnant Sheep (22.22%) and the difference was significant (P<0.05). Male (56.52%), Young (52.86%), Sokoto red (56.14%) and non-pregnant Goats (50.72%) were more infected than female (48.25%), adult (51.47%), Sahel (46.74%) and lactating goats (42.31%) and the difference was non-significant (P>0.05). The study revealed that Sheep and Goats in the study area are infected with various gastrointestinal helminthes hence the need for a targeted control effort.

Keywords: Epidemiology, Gastrointestinal, Helminthes, Sheep, Goats, Suleja

INTRODUCTION

Livestock are critical livelihoods for most rural households (Kaur *et al*., 2017) with multiple direct and indirect benefits (Pica-Ciamara *et al.*, 2011). Direct benefits include household income, household food sources (meat, milk and eggs), manure, draft power and transport services. Indirect benefit includes social status, collateral security, form of savings and insurance (Pica-Ciamara *et al.*, 2011). Livestock farming and trading are sources of income in rural communities across Nigeria, especially among subsistence farmers and pastoralists, contributing approximately 1.7% of the national gross domestic product (GDP) and approximately 9% of the agricultural value added (FAO, 2019). Over the years, parasitic infections have remained a major challenge to productivity in livestock farming in Nigeria, with helminth infections accounting for up to 79.92% of infections (Karshima *et al*., 2018; Ola-Fadunsin *et al*., 2020). The extensive system of animal husbandry commonly practiced across the country contributes to the incidence of parasitic infections. Although the effects of these infections are difficult to measure, they result in economic losses reflected in poor growth rates and reduced production of meat, milk, wool, and carcass quality (Strydom *et al.*, 2023). However, parasitism represents a major constraint limiting livestock production in most developing countries (Eke *et al.*, 2019). Livestock diseases result in significant economic impacts globally. Among livestock diseases, Gastrointestinal parasitic infections in ruminant livestock result in adverse effects on feed intake, growth rate, carcass weight and composition, wool growth, fertility and milk yield. Parasite infections of the gastrointestinal tract represent a serious challenge to the health, welfare and productivity of livestock (Morgan *et al.*, 2013). Gastrointestinal helminthes are major contributing factors to reduced productivity in sheep and goats. Parasitic infections range from acute disease frequently with high rates of mortality and chronic disease leading to various degree of morbidity and pre-mature culling to sub-clinical infections where the animals may be relatively healthy but perform below their potential (Gana *et al*., 2015). Gastrointestinal Nematodes significantly affect sheep and goat production and reproductive performance (Asmare *et al*., 2016). Their epidemiological patterns rely on the factors related to the parasite -host such as host nutrition, poor hygiene and sanitation (Tesfaye *et al*., 2021). Various environmental factors associated with Gastrointestinal Nematodes are agroecological conditions, livestock practices, housing system, deworming schedules and grassland management (Retanapob *et al*., 2011). The susceptibility of animals to various Gastrointestinal parasites is attributed to factors such as unsanitary living conditions, inadequate treatment, close contact with pathogenic animals and harsh climatic conditions (Gadahi *et al*., 2009; Dabasa *et al*., 2017). Environmental factors and lack of awareness among animal owners further increase parasitic infections (Tehmina *et al*., 2014). Among these Gastrointestinal parasites, the most common parasites infesting the livestock are *Hemonchus contortus, Ascaris, Strongyloids, Trichostrongyliods, Ostertagia, Trichuris, Dictyocaulus, Trichnellia, Enterobius, Cooperia, Gunagylonema, Chabertia, Oesphagostomum* (Mekonen, 2021). Several studies have been carried out on Gastrointestinal Helminthe of small ruminants in Nigeria, there is however scarcity of published literature (Pubmed, Google scholar, Science direct search) on Gastrointestinal Helminthes of Sheep and Goats in the study area. Without

proper epidemiological data on the prevalence and distribution of Gastrointestinal Helminthes of small ruminants, it will be difficult to design an effective prevention and control strategies. To address this knowledge gap, this study was carried out to determine the prevalence and distribution of Gastrointestinal Helminthes of Sheep and Goats in Suleja Local Government Area of Niger State, Nigeria that will guide evidence-based control programs.

Study Area

This study was carried out in Suleja local Government area of Niger State, North Central, Nigeria. Suleja lies between Latitude 9º10'15" and 9º12′1.17″N of equator and Longitude 7º10′20.25″ and 7º11′40.05″E of Greenwich meridian. It covers a land area of 136.33 km2 and had a population of 216,578 (NPC, 2006). The area has gentle rock and the soils are derived from geological parent materials developed on sand stone formations. The soils are usually deep, red and enriched with clay sub-soil (Niger State Bureau of Statistics, 2011; Aminu, *et al*., 2013). Suleja has tropical climate with an average annual temperature of 26.3 °C and the average rainfall is 1405 mm. The driest month is December. The highest precipitation occurs in September; with an average of 272 mm. March is the warmest month of the year with average temperature of 29.0 °C. The lowest average temperature is in August at 24.5°C (Aminu, *et al*., 2013).

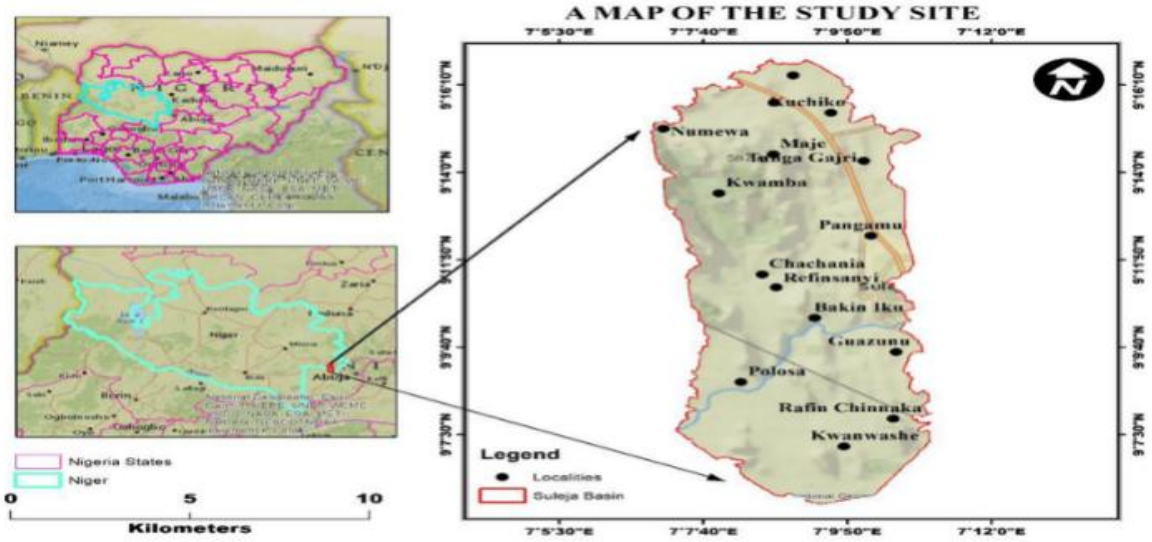

Figure 1: Map of Nigeria showing Suleja LGA (the Study Area). Source: Atemoagbo *et al*., (2024)

Sample Size Determination

The sample size was determined by the formular as described by Thrusfied (2005) at 95% confidence level and 5% precision and considering 50% estimated prevalence. The calculated sample size was 384. However, to increase the precision of the study, the sample size was increased to four hundred (400)

N= [1.96^2 Pexp (1-pexp)] /d^2] (1)

Where

N=Sample size

Pexp= expected prevalence and

d=desired absolute precision

Study Animals and Sampling Methods

The study animals were indigenous Sheep and Goats within various age groups, both sexes, different breeds and physiological status that are kept under traditional and extensive management system and owned by small holder farmers. Sheep and Goats were selected by simple random Sampling technique. All animals were identified and assigned unique identification number and the numbers were used to randomly select the animals. The age of the animal was estimated by looking at the dentition pattern of the animal according to (Fradson *et al.*, 1992) and also by owner's response. Animals with the age between six (6) months and less were considered young while greater than or equal to one (1) year were considered adults. Breeds identification was done according to the keys of Blench (1999) for traditional livestock of West Africa. The sex of each animal was determined by physical examination of the reproductive organs. Those with mammary gland were grouped as females while those with testes were considered males. The physiological status of the female was categorized as pregnant, non-pregnant and lactating.

Sample Collection

A total of four hundred (400) fresh faecal samples were collected directly from the rectum of one hundred and ninety four (194) sheep and two hundred and six (206) Goats using gloved fingers. The faecal samples collected was placed in a universal sterile bottle and transported to Entomology and Parasitology laboratory, Faculty of Veterinary Medicine, University of Abuja (A.K.A. Yakubu Gowon University), Abuja, Nigeria for analysis.

Examination of Faecal Samples

The method employed was the floatation technique described by Foryet (2001) and formol ether concentration technique (Cheesbrough, 2009).

Floatation Technique

Floatation technique is based on the assumption that helminthe eggs will float to the surface of the floatation medium. About 2g of faeces was crushed using sterile swab stick to break the faeces which in most cases were in pellets so as to give a solution. After obtaining a homogeneous mixture, it was sieved and placed in a test tube. The test tube containing the homogeneous mixture was then placed in a centrifuge machine for about 5 minutes at 1200 rpm. The floatation medium (Nacl) was added to the filtrate and filled to the brim until a convex meniscus was formed on the test tube. A cover slip was placed and left for about three (3)

minutes. After then, the cover slip was pulled gently from the test tube and placed on a microscope slide and viewed under x10 and x40 objectives of the microscope (Foreyt, 2001). Eggs of parasites were identified on the basis of their morphological features as described by Soulsby (1982)

Formol Ether Concentration Technique (FECT)

The modified Formol-Ether concentration technique was used to concentrate eggs of gastrointestinal parasites (Cheesbrough, 2009). Briefly, 1 g of stool sample was emulsified with 4 ml of 10% formol saline in a test tube. The mixture was filtered into a test tube using a cloth gauge and 3-4 ml of diethyl ether was added and shaken vigorously and allowed to stand for two minutes. The mixture was then centrifuged at 1000 revolutions per minutes (1000 rpm) for 3 minutes. Using a glass rod, the faecal debris from the side of the tube was loosened and the tube inverted to pour off the supernatants. The tube was returned to its original upright position and the fluid from the side of the tube allowed draining to the bottom. The bottom of the tube was tapped to resuspend and mix the sediment. The sediment was transferred to a slide and examined for presence of eggs of parasites using the X10 and X40 objectives respectively. Parasite identification was done using the keys of (Soulsby, 1982; Kaufmann, 1996; Foreyt, 2001).

Parasite Count/Load

Faecal samples were subjected to Stoll's technique for counting helminths egg and the degree of infection was identified based on total egg count per gram of faeces (epg) (Urquhart, 1996; Ballweller, 2001). The animals were then categorized as low (100-250 epg), moderate (250-500 epg) and high (>500 epg) according to their egg per gram (EPG) of faces counts (Soulsby, 1982; Urquhart, 1996).

Stoll's Dilution Technique

The technique was used to determine the total egg count per gram of faeces (epg) as described by (Soulsby, 1982). The technique was carried out by mixing the faecal sample and then 3 grams of faeces were weighed with the help of a balance and put in 100 ml graduated beaker. The beaker was then filled with water up to 42 ml mark and the faeces were thoroughly mixed with water by magnetic stirrer. The mixture was then strained with a coffee strainer. The strained mixture was again shaken and 0.15 ml of mixture was taken with a 1 ml special pipette and put on a glass slide and covered with a cover slide. Care was taken to avoid bubble formation. The slide was then placed under the microscope and the eggs were identified and counted. The total number of eggs of parasites found in the slide was multiplied by 100 to get the eggs per gram of faeces (epg)

Statistical Analysis

The data obtained from this study was analysed using descriptive statistics and the result presented in percentages. The association between the prevalence of Gastrointestinal helminthes and risk factors such as sex, age, breed, physiological status was analyzed using Chi square test (χ^2). In all analysis, confidence level was held at 95% and $P<0.05$ set for significance.

RESULTS AND DISCUSSION

Overall Prevalence of Gastrointestinal Helminthes (GIP) of Small Ruminants in the Study Area

The result of this study (Table 1) revealed that a total of 400 samples were collected from one hundred and ninety four (194) sheep and two hundred and six (206) goats, 192 were infected with various gastrointestinal Helminthes with an overall prevalence of 48% recorded. The study revealed that 85 sheep and 107 goats were infected with a prevalence of 43.81% and 51.94% in sheep and goats respectively. The study revealed that Goats (51.94%) had the highest prevalence as compared to sheep with a prevalence of 43.81% and the difference was not statistically significant ($P>0.05$).

Table 1: Overall Prevalence of Gastrointestinal Helminthes (GIH) of Sheep and Goats in Suleja local Government, Niger State, Nigeria

Species	No. Examined	No. Infected	Prevalence (%)	χ^2	df	P-value
Sheep	194	85	43.81	2.644	1	0.104
Goats	206	107	51.94			
Total	400	192	48.00			

χ^2 =Chi square, df=degree of freedom

Ova of Different Gastrointestinal Helminthes of Sheep and Goats in the Study Area

Table 2 shows the different ova of gastrointestinal helminthes of sheep and Goats in the study area. The study revealed the different ova of gastrointestinal Helminthes of sheep and goats identified in the study area (Table 2). A total of Seven (7) Gastrointestinal Helminthes ova were identified in this study and these include three (3) Nematode genera namely: *Strongyloides spp* 59 (14.75%), *Strongyle spp* 50 (12.5%) and *Toxocara spp* 51 (12.75%), two (2) Cestode genera namely: *Taenia spp* 17 (4.25%) and *Monieza spp* 9 (2.25%) and two trematode genera namely: *Fasciola spp* 2 (0.5%) and *Schistosoma spp* 5 (1.25%) being the only trematode species identified in this present study. Six (6) gastrointestinal Helminthes parasites were detected in Sheep and these include three (3) nematode genera namely: *Strongyloides spp* with a prevalence 15.46%, *Strongyle spp* (10.82%) and *Toxocara spp* (11.86%), two Cestode genera namely: *Taenia spp* and *Monieza spp* with a prevalence of 3.09% and 1.55% respectively. The only trematode species encountered in sheep was *Schistosoma spp* with a prevalence of 1.03%. No *Fasciola spp were* identified in Sheep. Among the Helminthe parasites recovered in sheep, nematodes were the most dominant parasites followed by cestodes while trematodes were the least dominant species. Among the parasites, *Strongyloides spp* (15.46%) had the highest prevalence followed by *Toxocara spp* (11.86%), *Strongyle spp* (10.82%), *Taenia spp* (3.09%), *Monieza spp* (1.55%) while *Schistosoma spp* (1.03%) had the least prevalence (Table 2).

Seven (7) gastrointestinal Helminthes were detected in Goats in this study (Table 2). Three (3) nematode genera identified include *Strongyle spp* with a prevalence of 14.08%, *Strongyloides spp* (14.08%) and *Toxocara spp* (13.59%). Two Cestode genera were identified including *Taenia spp* with a prevalence of 5.34% and *Monieza spp* with a prevalence of 2.91%. The only trematode species identified were *Fasciola spp* with a prevalence of 0.97% and *Schistosoma spp* with a prevalence of 1.46%. Among the Helminthe parasites, the

most prevalent were the nematode genera followed by cestode genera while the trematodes were the least dominant species. Among the parasites, *Strongyle spp* (14.08) and *Strongyloides spp* (14.08%) were the most prevalent species followed by *Toxocara spp* (13.59%), *Taenia spp* (5.34%), *Monieza spp* (2.91%), *Schistosoma spp* (1.46%) while *Fasciola spp* had the least prevalence of (0.97%) making it the least prevalent of all the gastrointestinal Helminthes infections recovered in this study.

Table 2: Ova of Different Gastrointestinal Helminthes of Sheep and Goats in the Study Area

Helminthes	Parasites	Sheep (n=194)	Goats (n=206)	Total (n=400)
		No. infected (%)	No. infected (%)	No. infected (%)
Nematodes	*Strongyloides spp*	30 (15.46)	29 (14.08)	59 (14.75)
	Toxocara spp	23 (11.86)	28 (13.59)	51 (12.75)
	Strongyle spp	21 (10.82)	29 (14.08)	50 (12.5)
Cestodes	*Taenia spp*	6 (3.09)	11 (5.34)	17 (4.25)
	Monieza spp	3 (1.55)	6 (2.91)	9 (2.25)
Trematodes	*Fasciola spp*	-	2 (0.97)	2 (0.5)
	Schistosoma spp	2(1.03)	3 (1.46)	5 (1.25)

Mean Parasite Load Egg Per Gram (epg) of Faeces Count of Gastrointestinal Helminthe of Sheep and Goats in the Study Area

Table 3 shows the mean parasitic load of Gastrointestinal Helminthe of small ruminants in the study area. An overall mean epg count of 175±20 was recorded in Sheep with an epg range of infection between 100 and 1300 while in Goats, an overall mean epg count of 169±13 was recorded with an epg range of infection between 100 and 900 epg count (Table 3). The study shows that Sheep had the highest mean epg count of 175 ±20, while goats had the least means epg count of 169±13. Sheep had the highest parasitic load between 100 and 1300 which is high, while goats recorded the least parasitic load range between 100 and 900 which is high. This study shows that the epg range of both species of animals are high. *Strongyloides spp* had the highest parasitic load between 100 and 1300 while *Schistosoma spp* had the least parasitic load between 100 and 100 in Sheep. While in Goats, *Toxocara spp* had the highest parasitic load between 100 and 900 while *Fasciola spp* had the least parasitic load between 100 and 100.

Table 3: Mean Parasite Load (epg) of GIH of Sheep and Goats in the Study Area

Parasites	Sheep epg range	Mean±SE	Goats epg range	Mean±SE
Strongyle spp	100-800	173±41	100-700	144±24
Toxocara spp	100-1100	200±33	100-900	192±34
Strongyloides spp	100-1300	172±42	100-600	204±26
Schistosoma spp	100-100	100±0	100-200	133±33
Taenia spp	100-700	113±13	100-300	154±22
Monieza spp	100-100	100±0	100-200	130±15
Fasciola spp	-	-	100-100	100±0
Total	100-1300	175±20	100-900	169±13

epg (egg per gram) of faeces, SE (Standard Error)

Sex Related Risk Factor for Gastrointestinal Helminthe of Sheep and Goats in the Study Area

Sex related risk factor associated with GIH of sheep and goats in relation to sex is shown in Table 4. Out of 194 samples examined from Sheep (75 males and 119 females), 27 (36%) and 58 (48.74%) were infected respectively. Out of 206 sampled examined from Goats (92 males and 114 females), 52 (56.52%) and 55 (48.25%) were infected respectively. Based on the result (Table 3) of this study which shows a higher prevalence in female sheep (48.74%) than male sheep (36%) and the difference was not statistically significant (P>0.05). While in Goats, a higher prevalence was observed in male goats (56.52%) as compared to female goats (48.25%) and the difference was not statistically significant (P>0.05).

Table 4: Sex Related Risk Factor for GIH of Sheep and Goats in the Study Area

Species	Sex	No. examined	No. Infected	Prevalence (%)	χ^2 value	df	P
Sheep	Male	75	27	36.00	3.033	1	0.082
	Female	119	58	48.74			
Total		194	85	43.81			
Goat	Male	92	52	56.52	1.397	1	0.237
	Female	114	55	48.25			
Total		206	107	51.94			

χ^2 =Chi square, df=degree of freedom

Age Related Risk Factor for Gastrointestinal Helminthes of Sheep and Goats in the Study Area

The age-related risk factor associated with GIH of Sheep and Goats in the study area is shown in Table 5. Out of 52 young and 142 Adult sheep examined, 21(40.38%) and 64 (45.07%) were infected respectively. The study shows that adult sheep (45.07%) are more infected than young sheep (40.38%) and the difference was not statistically significant (P>0.05). Out of 70 young and 136 Adult Goats examined, 37 (52.86%) and 70 (51.47%) were infected respectively and the difference was not statistically significant. The study indicates that younger goats (52.86%) had the highest prevalence as compared to adult goats with a prevalence of 51.47%. The difference was not statistically significant (P>0.05).

Table 5: Age Related Risk Factors for GIH of Sheep and Goats in the Study Area

Species	Age	No.examined	No.infected	Prevalence (%)	χ^2	df	P-value
Sheep	Young	52	21	40.38	0.340	1	0.560
	Adult	142	64	45.07			
Total		194	85	43.81			
Goats	Young	70	37	52.86	0.0366	1	0.850
	Adult	136	70	51.47			
Total		206	107	51.94			

χ^2 =Chi square, df=degree of freedom

Breed Related Risk Factor for Gastrointestinal Helminthes of Sheep and Goats in the Study Area

The breed related risk factor for gastrointestinal helminthes of Sheep and Goats is shown in Table 6. Out of 99 Balami, 41 Yankasa and 54 Uda breeds of sheep examined, 44, 25 and 16 were infected with a prevalence of 44.4%, 60.97% and 26.63% respectively. The result showed that Yankasa breeds of sheep had the highest prevalence of 60.97% followed by Balami breeds (44.44%) while Uda (26.63%) had the least prevalence and the difference was statistically significant (P<0.05). Out of 114 Sokoto red and 92 Sahel breeds of Goats examined, 64 Sokoto red and 43 Sahel goats were infected with a prevalence of 56.14% and 46.74% respectively. There was no statistically significant difference (P>0.05) in the prevalence of infection among the breeds of goats. The study indicates that Sokoto Red (56.14%) are more infected than Sahel Goats (46.74) and the difference was not statistically significant (P>0.05).

Table 6: Breed Related Risk factor for GIH of Sheep and Goats in the Study Area

Species	Breeds	No. examined	No.infected	Prevalence (%)	χ^2	df	P-value
Sheep	Balami	99	44	44.44	9.335	2	0.009*
	Yankasa	41	25	60.97			
	Uda	54	16	26.63			
	Total	194	85	43.81			
Goat	Sokoto Red	114	64	56.14	1.803	1	0.179
	Sahel	92	43	46.74			
	Total	206	107	51.94			

* Significant (P<0.05). χ^2 =Chi square, df=degree of freedom

Physiological Status Related Risk Factor for Gastrointestinal Helminthes of Sheep and Goats in the Study Area

Table 7 shows the physiological status related risk factor for gastrointestinal helminthe of sheep and goats. Among the Physiological status of female sheep, out of 36 pregnant, 19 lactating and 64 non-pregnant sheep examined, 8 (22.22%), 9 (47.37%) and 41 (64.06%) were infected respectively. The study shows that non-pregnant sheep had the highest prevalence of 64.06% followed by lactating 47.37% while pregnant sheep had the least prevalence of 22.22% and the difference was statistically significant (P<0.05). In goats, out of 19 pregnant, 26 lactating and 69 non-pregnant goats examined, 9 (47.37%), 11 (42.31%) and 35 (50.72%) were infected respectively. Non-pregnant (50.72%) and pregnant (47.37%) goats had the highest prevalence as compared while lactating female goats had the least prevalence of 42.31% with no significant difference (P>0.05) between them.

Table 7: Physiological Status Related Risk Factors for GIH of Sheep and Goats in the Study Area

Species	Physiological Status	No. Examined	No. Infected (%)	χ^2	df	P-value
Sheep	Pregnant	36	8 (22.22)	16.161	2	0.000*
	Lactating	19	9 (47.37)			
	Non-pregnant	64	41 (64.06)			
Total		119	58 (48.74)			
Goats	Pregnant	19	9 (47.37)	0.543	2	0.762
	Lactating	26	11 (42.31)			
	Non-pregnant	69	35 (50.72)			
Total		114	55 (48.25)			

*Significant (P<0.05). χ^2 =Chi square, df=degree of freedom

Discussion

Gastrointestinal Helminthes are among the most important disease-causing agents in veterinary medicine, particularly livestock. They cause economic losses by reducing the production of milk, meat and wool (Income *et al*., 2021). The study revealed 48% overall prevalence of Gastrointestinal Helminthes of Sheep and Goats in the Suleja Local Government Area of Niger State, Nigeria. This prevalence of 48% reported in this study agrees with the findings from similar ecological zones in Nigeria such as 42.7% by Hassan and Jibrin (2022) in Bauchi State, 40% by Chuckwudi *et al*. (2024) in Enugu State. This prevalence is however lower than

similar findings carried out in Nigeria Such as 78.54% by Eke *et al.*, (2020) in Niger State, 77.5% by Aliyu *et al*. (2020) in Nasarawa State, 63.6% by Gofwan *et al.* (2024) in Plateau State, Nigeria. This prevalence is similar to the findings in African countries such as Dagnachew *et al*. (2011) who recorded a prevalence of 47.67% in Northwest Ethiopia, 50.24% by Muhammad *et al*. (2023) in Egypt. The differences in the prevalence recorded in these studies maybe attributed to differences in the environment, geographical locations, Sample size and climatic conditions.

The study revealed that Goats (51.94%) are more in infected than Sheep (43.81%) with no significant difference between them (P>0.05). This is similar to the findings of Hassan and Jibrin (2022) in Bauchi State, Nigeria who reported that Sheep were less infected with gastrointestinal Parasites as compared to Goats. The results of this study agree with the findings of Islam and Taimur (2008), Negasi and Bogale (2012), Ntonifor *et al*. (2013), Nuhu *et al.* (2025) and Oguche *et al.* (2025) who reported the highest infection rate among Goats as compared to Sheep. This is not in accordance with the findings of Dauda *et al*. (2024) who reported the highest prevalence among Sheep as compared to Goats. The high prevalence of infection recorded among Goats I'm this study may be due to the fact that Sheep develops more resistance to infection than Goats (Hoste *et al*., 2006, Sharma and Mandal 2013). Goats tend to be more infected to gastrointestinal parasites than other small ruminants due to their immune system's limited response to certain parasites, shaped by evolutionary history and the non-nomadic nature of goat rearing (Mpofu *et al*., 2020). This agrees with Bedade *et al.* (2018) who reported that goats are particularly vulnerable to gastrointestinal parasitism due to their slow development of immunity against such infection.

The study revealed the different ova of gastrointestinal Helminthes of sheep and goats identified in the study area. A total of Seven (7) Gastrointestinal Helminthes ova were identified in this study and these include three (3) Nematode genera namely *Strongyloides spp* 59 (14.75%), *Strongyle spp* 50 (12.5%) and *Toxocara spp* 51 (12.75%), two (2) Cestode genera namely: *Taenia spp* 17 (4.25%) and *Monieza spp* 9 (2.25%) and two trematode genera *Fasciola spp* 2 (0.5%) and *Schistosoma spp* 5 (1.25%) being the only trematode species identified in this present study. The parasites identified in this study agrees with the report of Gadahi *et al*., 2009 who reported that these parasites are the most successful parasites of small ruminant animals. The study revealed a high prevalence of *Strongyloides spp* (14.75%) which agrees with similar findings of Odoi *et al*. (2007) and Akeju *et al*. (2024) who reported the highest prevalence of *Strongyloides spp.*

Six (6) gastrointestinal helminthes parasites were detected in Sheep and these include include *Strongyloides spp* with a prevalence 15.46%, *Strongyle spp* (10.82%) and *Toxocara spp* (11.86%), two Cestode genera namely; *Taenia spp* and *Monieza spp* with a prevalence of 3.09% and 1.55% respectively. The only trematode species encountered in sheep was *Schistosoma spp* with a prevalence of 1.03%. No *Fasciola spp were* identified in Sheep. Among the Helminthe parasites recovered in sheep, nematodes were the most dominant parasites followed by cestodes while trematodes were the least dominant species. Among the parasites, *Strongyloides spp* (15.46%) had the highest prevalence followed by *Toxocara spp* (11.86%), *Strongyle spp* (10.82%), *Taenia spp* (3.09%), *Monieza spp* (1.55%) while *Schistosoma spp* (1.03%) had the least prevalence. The presence of *Strongyloides spp* has been reported by Thamsborg *et al*. (2017) and Afshan *et al*. (2024) suggesting that while *Strongyloides papilossus* infections are often subclinical, their presence reflects environmental contamination and inadequate hygiene around animal holding areas. Seven (7) gastrointestinal Helminthes were detected in Goats in this study, three (3) nematode genera identified include *Strongyle spp* with a prevalence of 14.08%, *Strongyloides spp* (14.08%) and *Toxocara spp* (13.59%). Two Cestode genera were identified including *Taenia spp* with a prevalence of 5.34% and *Monieza spp* with a prevalence of 2.91%. The only trematode species identified were *Fasciola spp* with a prevalence of 0.97% and *Schistosoma spp* with a prevalence of 1.46%. Among the Helminthe parasites, the most prevalent were the nematode genera followed by cestode genera while the trematodes were the least dominant species. Among the parasites, *Strongyle spp* (14.08) and *Strongyloides spp* (14.08%) were the most prevalent species followed by *Toxocara spp* (13.59%), *Taenia spp* (5.34%), *Monieza spp* (2.91%), *Schistosoma spp* (1.46%) while *Fasciola spp* had the least prevalence of (0.97%) making it the least prevalent of all the gastrointestinal helminthes infections recovered in this study. The high prevalence of *Strongyloides spp* and *Strongyle spp* in this study agrees with the findings of Eke *et al.* (2019) who recorded *Strongyle spp* and *Strongyloides spp* as the most dominant parasites identified in the study. The high prevalence of *Strongyle spp* recorded in this study agrees with the findings of Mpofu *et al.* (2020) who reported *Strongyle spp* as the most dominant species observed in goats. The high prevalence of Nematode in this present study agrees with Tariq *et al*. (2010) who reported that Gastrointestinal Nematodes of The Trichongylidae family are perhaps the most important parasites of small ruminants worldwide, causing significant morbidity and loss of production. The high prevalence of nematode species in this study might be due to their direct life cycle and the fact that they do not require an intermediate host to complete their life cycle. The low prevalence of trematodes recorded in this study maybe due to limited presence of snails in the study area. Thus, snails play a crucial role in the occurrence and the geographic distribution of trematodes species (Bauri *et al*., 2015). Additionally, the grazing system, nutritional status and environment all influences incidence of flukes (Shinggu *et al.*, 2019).

The study shows the mean parasitic load of Gastrointestinal helminthe of small ruminants in the study area. An overall mean epg count of 175±20 was recorded in Sheep with an epg range of infection between 100 and 1300 while in Goats an overall mean epg count of 169±13 was recorded with an epg range of infection between 100 and 900 epg count. The study shows that Sheep had the highest mean epg count of 175 ±20, while goats had the least means epg count of 169±13. Sheep had the highest parasite load between 100 and 1300 which is high, while goats recorded the least parasitic load range between 100 and 900 which is high. This study shows that the epg range of both species of animal are high. *Strongyloides spp* had the highest parasitic load between 100 and 1300 while *Schistosoma spp* had the least parasitic load between 100 and 100 in Sheep. While in Goats, *Toxocara spp* had the highest parasitic load between 100 and 900 while *Fasciola spp* had the least parasitic load between 100 and 100. The parasitic load between 100 and 1300 epg recorded in this study is This is similar to the findings of Islam *et al*. (2017) who recorded an epg load between 100 and 1200.

The sex related risk factor revealed that female sheep (48.74%) are more infected than male sheep (36%) and the difference was not statistically significant (P>0.05). This agrees with the findings of Sagma *et al*. (2012), Raza *et al.* (2014) and Singh *et al*. (2017) and Usman *et al.* (2023) who reported that female Sheep are more infected than male sheep with no significant difference between them. This does not

agree with Yeasmin *et al*. 2015 who reported a higher prevalence among male sheep as compared to female sheep. The high prevalence of infection among female sheep might be due to stress and low immune status of the female during pregnancy and lactation (Dabasa *et al*., 2017). High level of Prolactin and Progesterone hormones also increases the susceptibility of females to any infection (Loyd, 1983). Male goats (56.52%) are more infected female goats (48.25%) and the difference was not statistically significant (P>0.05). This is similar to the reports Raza *et al*. (2014), Eke *et al*. (2019), Hassan and Jibrin (2022) who reported a higher prevalence of infection among male goats as compared to female goats and the difference was not statistically significant. Adua and Hassan (2016) 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 (Keyyu *et al*., 2003; Regassa *et al*., 2006; Ghanem *et al*., 2009; Hassan *et al*., 2013b). The high prevalence of infection among male goats as compared to female goats in this study maybe due to the stall feeding of female animals during pregnancy which reduces their exposure to contaminated pastures (Pal and Qayyum, 1992; Maqsood *et al*., 1996 and Ayaz *et al.*, 2013).

The age related risk factor revealed that adult sheep (45.07%) are more infected than young Sheep (40.38%) and the difference was not statistically significant (P>0.05). This agrees with the findings of Singh *et al*., 2017, Hassan ana Jibrin (2022), Bello *et al*., 2025 who reported that adult Sheep are more infected than young Sheep. Singh *et al*., 2017 reported a non -significant difference between young and adult goats and a significant difference between young Sheep and adult Sheep. Hassan and Jibrin (2022) recorded a non-significant different between young and adult of both species (Sheep and Goats). Several authors have documented that adult animals are more prone to infection Urquhart *et al*. (1996), Taswar *et al*. (2011) due to repeated exposure as they mature (Dagnachew *et al*. (2011). The high prevalence of adult sheep in this study could be attributed to prolong exposure to infective larvae on contaminated pastures and the cumulative nature of Helminthes infections in grazing animals (Salehi *et al*., 2022). The study revealed that young goats (52.86%) are more infected than adult goats (51.47%) and the difference was not statistically significant. This is similar to the findings of Zvinorova *et al*. (2016) and Islam *et al*. (2017) who recorded the highest prevalence among young goats as compared to adult goats. The high prevalence of young Goats as compared to adult goats recorded in this study may be attributed to the weak and lower immune system of the young animals as compared to the adults which exposes them to infection. Lambs or young stock in their first grazing season tend to have no natural immunity to gastrointestinal nematodes parasites (Lemma *et al*., 2021). Lower prevalence of infection in adult goats might be due to body resistance as they might have developed immunity due to repeated natural infections (Singh *et al*., 2015).

The breed related risk factor revealed that Yankasa (60.97%) breeds recorded the highest infection rate as compared to Balami (44.44%) and Uda breed (26.63%) having the least prevalence among Sheep breeds and the difference was statistically significant (P<0.05). This is in agreement with the findings of Bello *et al*., 2025 who reported the highest prevalence among Yankasa breeds, followed by Balami and Uda breeds. This does not agree with the findings of Jegede *et al*., 2015 and Omowaye *et al.*, 2019 who recorded the highest infection among Uda breeds of sheep as compared to yankasa and balami breeds. Among goat breeds, Sokoto red (56.14%) had the highest prevalence while Sahel breeds (46.74%) had the least prevalence and the difference was not statistically significant (P>0.05). This is in concordance with the findings of Adejinmi *et al*. (2015) and Akeju *et al.* (2024) who recorded the highest prevalence among Sokoto red goats as compared to other breeds of Goats. This agrees with previous findings that indigenous breeds differ in their resistance or tolerance to parasitic infections (Muhammad *et al*., 2017; Sinodo *et al*., 2021). Breed based resistance has been reported in several studies by Madziga *et al*. (2024) suggesting that selective breeding for resistance could be a sustainable control strategy in endemic regions.

The Physiological status related risk factor revealed that non-pregnant (64.06%) and Lactating sheep (47.37%) had the highest prevalence as compared to a lower prevalence of 22.22% recorded for Pregnant Sheep and the difference was statistically significant (P<0.05). While in Goats, non-pregnant goats (50.72%) and pregnant (47.37%) goats had the highest prevalence while lactating female goats recorded the least prevalence (42.31%) and the difference was not statistically significant (P>0.05). This is not in agreement with the findings of Dey *et al*. (2021) in Bangladesh who recorded the highest prevalence among pregnant, and lactating female Sheep. The highest prevalence observed in non-pregnant Sheep and Goats may be attributed to the greater number of non-pregnant females examined in this study. The Physiological stress condition in females during pregnancy and lactation which suppress the immunity and increased susceptibility to helminthe invasion (Salehi *et al*., 2022; Said *et al*., 2025).

CONCLUSION

The result revealed that Sheep and Goats in Suleja Local Government Area of Niger State are infected with various gastrointestinal Helminthes with an overall prevalence of 48% with Sheep being more infected than goats. Seven gastrointestinal Helminthes were identified with *Strongyloides spp* having the highest prevalence while *Fasciola spp* had the least prevalence. Female, adult, yankasa and non-pregnant Sheep are more infected than male, young, uda and pregnant Sheep. Male, young, Sokoto red and non-pregnant Goats were more infected than female, adult, sahel and lactating female goats. The result of the study shows that Sheep and goats in the study area are infected with different gastrointestinal helminthes, hence, a targeted prevention and control strategies should be implemented to minimize the impact of Gastrointestinal Helminthes on these animals. It is however recommended that there should be regular and strategic deworming of animals, education of farmers on the use of anthelmintics as well as improvement in the general farm management practices.

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