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PREVALENCE OF *PARAMPHISTOMUM* SPECIES IN CATTLE SLAUGHTERED AT GWAGWALADA ABATTOIR, ABUJA, NIGERIA

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A cross sectional study was carried out in September 2017−April 2018, in Gwagwalada abattoir to determine prevalence of *Paramphistomum* spp. in slaughtered cattle. Six hundred and forty eight (648) cattle were subjected to standard meat inspection procedures for the presence of *Paramphistomum* spp. Parasites were determined during initial examination and then determination was clarified microscopically to appreciate the morphology of adult *Paramphistomum* spp. The overall prevalence of Paramphistomum spp. in the study was (59.7 %). The prevalence was higher in male than in female cattle with prevalence of 51.4 % and 48.6 % respectively. A statistically significant difference ($P<0.05$) in prevalence of *Paramphistomum* spp. due to season of sampling, and to cattle species, sex, and age was observed. The highest infection rate of cattle with *Paramphistomum* spp. was observed in October. The revealed high infection rate of cattle with *Paramphistomum* spp. testifies to an intensive transmission of these parasites in the region, potentially resulting in immense economical losses in the area examined. Therefore, it is recommended to cattle breeders to improve feeds provision in order to obtain good body condition providing sufficient level of resistance against *Paramphistomum* infections. Integrated control approach using selected anthelmintic therapy and snail control to reduce the magnitude of the problem is also recommended.

Keywords: *Paramphistomum* spp., prevalence, cattle, Gwagwalada, Nigeria

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In Nigeria, 13.9 million cattle population provides not only the main source of animal proteins; by-products, such as bones and skins also play a vital role in economic well-being

of the human populace (Sani, 2009; Lawal-Adebowale, 2012). A considerable 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 (Omeke, 1988; Bettencourt et al., 2015). Their production is however constrained by a variety of gastrointestinal helminthes, which are characterized by decrease in milk production, reduced product quality, mortality and other secondary infections (Saha et al., 2013). Helminthes including trematodes are known to be potential health hazard to cattle population and are therefore major impediment to efficient livestock production, characteristically affecting their growth and productive performances (Bisset, 1994; Charlier et al., 2015).

Among the plethora of Trematodes, *Paramphistomum* infection is established to have a devastating effect to cattle production globally, but the highest prevalence has been reported in tropical and subtropical regions, particularly in Africa including Nigeria (Khedri et al., 2015; Elelu et al., 2016). The epidemiology of *Paramphistomum* infection in cattle is determined by several factors governed by parasite-host-environment interactions (Martinez-Ibeas et al., 2016). Adults of *Paramphistomum are* found in the rumen and reticulum whilst immature parasites are found in the duodenum. Adult *Paramphistomum* flukes parasitize mainly in the fore stomachs of cattle causing irregular rumination (ruminitis), lower nutrition conversion, loss of body condition, decrease in milk production, and reduction of fertility rate (Mogdy et al., 2009; Ayalew et al., 2016). The immature flukes occur in the upper part of the small intestine (duodenum and ileum) causing hemorrhage, which leads to anaemia, weight loss, decreased production; death of animals may also occur (Maitra et al., 2014).

The taxonomy of paramphistomes has been extensively studied by light and electron microcopy, yet there are still areas where consensus is lacking. The major species that cause the disease include *Paramphistomum cervi* (Zeder, 1790), *P. cotylophorum* (Fischoeder, 1901), *P. gotoi* Fukui, 1922, *P. gracile* Fischoeder, 1901, *P. hiberniae* Willmott, 1950, *P. ichikawai* Fukui, 1922, and *P. epicitum* Fischaedar, 1904. The ones that are predominantly found in Africa are *P. cervi* and *P. microbothrium* Fischoeder, 1901 (Smyth, 1996). Although *Paramphistomum* infection outbreaks in different communities have been extensively studied in different states in Nigeria (Biu, Oluwafunmilayo, 2004; Bunza et al., 2008; Njoku et al., 2009; Adedipe et al., 2014; Afolabi et al., 2017; Shola et al., 2020), there is paucity of information on the prevalence of this parasite in the Federal Capital Territory. This is essential for the design of an effective control strategy. The study was conducted to determine prevalence of *Paramphistomum* species in cattle slaughtered at Gwagwalada abattoir, Abuja, Nigeria.

MATERIALS AND METHODS

The study was carried out in Gwagwalada Area Council, one of the six councils of the Federal Capital Territory (FCT), Abuja – Nigeria. It is located geographically in the central part of Nigeria

between latitude 8°25'–9°9' N and longitude 6°29'–7°45' E. It has a Guinea Savannah type of vegetation, with rainy season stretching from April to October and dry season from November to March. The climate of the study area is tropical: non-arid climate with only two seasons throughout the year: wet and dry. The mean temperature in the study area ranges between 30–37 °C yearly with the highest temperature in March and the mean total annual rainfall of approximately 1650 mm per annum (NPC, 2006).

A cross sectional study was carried out on slaughtered animals in Gwagwalada abattoir for 3 days in a week during early dry season (September–December 2017) and 2 days in a week during the late dry season (January–April, 2018). The animals were randomly selected for sampling. Six hundred and forty-eight (n = 648) cattle slaughtered in Gwagwalada Area Council abattoir, Abuja, Nigeria were examined for the presence of *Paramphistomum* species. Adult worms were collected from the rumen and reticulum of the animal sampled using a standard meat inspection procedure that involves both primary and secondary examination.

Ante mortem inspection was carried out in animals before slaughter, to assess them generally. During the ante mortem examination, detail records about the species, sex, age, and breeding status of the animals were recorded. Ageing of the cattle was based on rostral dentition as described by Lasisi et al. (2002). Cattle aged (< 3 years old) were classified as young while (> 3 years old) were considered as adults. Sexual differentiation was based on the appearance of external genitals while breed identification was based on morphology as described by Yunusa et al. (2013).

Rumen of slaughtered animals selected to be sampled were inspected for the presence of rumen flukes. The collected flukes were transported to the laboratory in plastic containers with 10 % formalin. The flukes were washed several times in running tap water to remove debris and ruminal content. The flukes were later prepared for identification under stereomicroscope. Furthermore, collected flukes were preserved for further identification.

Rumen and reticula were systematically inspected for the presence or absence of adult *Paramphistomum* to estimate fluke burden using standard meat inspection procedures which include primary and secondary examination. The primary examination includes visualization and palpation. During the secondary examination further incision of the rumen and reticulum was made to check presence or absence of *Paramphistomum* spp. as described by Urquhart et al. (1996).

Rumen flukes were preliminarily identified under microscope using low power magnification and then slides were prepared for detailed morphological studies and identification. Flukes collected in Petri dishes were observed using stereoscope to appreciate the morphology. Final identification of *Paramphistomum* was done based on morphological features, such as shape, posterior sucker (acetabulum), anterior sucker, terminal genitalium and tegumental papillae following the standard guidelines given by Urquhart et al. (1996).

DATA ANALYSIS

Data were collected during the study and fed into a computer using Microsoft excel spreadsheet and analyzed with Statistical software (SPSS – 20.0). Descriptive statistics was employed and expressed in terms of frequency and simple percentage. Chi square (χ^2), ANOVA (F-Test), and t-test statistics were used to test the relationship between variables.

RESULTS

The overall prevalence of *Paramphistomum* spp. in cattle slaughtered at Gwagwalada abattoir was 59.1 %. Higher prevalence of *Paramphistomum* spp. was recorded in adult cattle (62.0 %) than in young ones (42.1 %). There was statistically significant difference ($P < 0.05$) in the prevalence of *Paramphistomum* between two age groups and female cattle showed a higher prevalence (61.0 %) than male (57.4 %). Similarly, there was no statistically significant difference between the breeds examined ($P > 0.05$) (tabl. 1). Identification result showed statistically significant variation in prevalence of *Paramphistomum* spp. between both sexes ($P < 0.05$) (tabl. 1).

Table 1. Prevalence of *Paramphistomum* spp. in cattle slaughtered in Gwagwalada abattoir

Sample parameter		No. examined (%)	No. infected (%)	t	*P*- Value
Age	Young	95 (14.7)	40 (42.1)	4.231*	0.001 [a]
	Adult	553 (85.3)	343 (62.0)		
	Total	648	383 (59.1)		
Sex	Male	343 (52.9)	197 (57.4)	6.114*	0.000 [a]
	Female	305 (47.1)	186 (61.0)		
	Total	648	383 (59.1)		
Breed	WF	374 (57.7)	216 (57.8)	15.250**	0.762
	ND	152 (23.5)	95 (62.5)		
	SG	70 (10.8)	41 (58.6)		
	K	52 (8.0)	31 (59.6)		
	Total	648	383 (59.1)		

*not significant at $\alpha = 0.05$, [a]significant at $\alpha = 0.05$, * t – test, **chi square (χ^2).
Key: WF – White Fulani, ND – Ndama, SG – Sokoto Gudali, K – Keteku.

The infection rate is higher during early dry season (October–December), reaching its peak in the rainy season (tabl. 2).

Table 2. Monthly prevalence of *Paramphistomum* spp. in cattle slaughtered at Gwagwalada Area Council abattoir, Abuja

Months	Cattle examined	%	Infected cattle	%
September	73	11.3	58	79.5
October	92	14.2	77	83.7
November	70	8.8	25	35.7
December	70	8.8	32	45.7
January	75	11.6	27	36.0
February	86	13.3	37	43.0
March	102	15.7	66	64.7
April	80	12.3	61	76.3
Total	648	36.0	383	59.1

DISCUSSION

In this study, the overall prevalence of *Paramphistomum* spp. was 59.1 %; similar high prevalence (56 %) was recorded in Sokoto, Northern Nigeria (Bunza et al., 2008), 51.82 % in Ethiopia (Ayalew et al., 2016), and 53.1 % in Bangladesh (Paul et al., 2011). Lower prevalence rate was however, recorded in Turkey (8.95 %), Spain (18.8 %), and France (20 %) by Ozdal et al. (2010), González-Warleta et al. (2013) and Szmidt-Adjidé et al. (2000), respectively. The great variability shown in both cases is probably due to ecological and climatic differences between different locations throughout the continents of Africa, Asia and Europe. The other most important factors that influence the occurrence of trematodes in an area include availability of the suitable snail habitat (Dodangeh et al., 2019).

Findings of this study are in accordance with the reports of Davila et al. (2010), Raza et al. (2010) and Al-Shaibani et al. (2008) who had also revealed higher prevalence of helminthes in female. In this study, variation in occurrence of such helminthes in males and females might be due to variation in sample size (Bachal et al., 2002), stress, genetic resistance of host and insufficient/imbalanced feed against higher needs (Raza et al., 2010). Higher prevalence among females may be explained by loss of immunity during pregnancy, birth and lactation (Alade, Bwala, 2015).

The study did not identify any statistically significant difference in the rate of infection among the breeds ($P > 0.05$) examined.

Monthly prevalence showed that infection rate was higher in October and gradually fell down in November and increased in March. Similar work by Gul-E- Nayab et al. (2017) showed that prevalence of *Paramphistomum* spp. was highest in cattle in March and the lowest in November. Similar work by Chaudhri (2000) showed that there was significant decrease of the rate during raining season. It has been described that the bionomic requirements for breeding of *Planorbis* snails and development of intramolluscan stages of flukes often reach the optimum threshold during the wet months (Radostits et al., 2000).

However, during dry periods, breeding of snails (intermediate hosts) and development of larval flukes slow down or stop completely and snails undergo the aestivation state (Boray, 1994; Urquhart et al., 1996).

Although a decrease in prevalence was observed along with the advancement of dry season, relatively high prevalence rates were recorded, this may be due to infections acquired during previous peak of the snail activity season. The present study agrees with the finding of Akanda et al. (2014), who reported that parasitic infestation was highest in rainy season followed by summer and winter season.

CONCLUSION

In this study, *Paramphistomum* spp. was found to be prevalent in cattle. This will be a hindrance to the livestock production by causing remarkable direct or indirect losses in the study area. Moreover, the study area is suitable for the survival of the molluscan hosts that worsened the situation for the future. Therefore, taking into account the aforementioned conclusion, integrated control approach using selected anthelmintic therapy and snail control should be implemented to reduce the magnitude of the problem. In addition, awareness of the cattle breeders about the disease should be raised to enable them actively participate in control programs.

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ЗАРАЖЕННОСТЬ ВИДАМИ PARAMPHISTOMUM КРУПНОГО РОГАТОГО СКОТА НА СКОТОБОЙНЕ В ГВАГВАЛАДА (АБУДЖА, НИГЕРИЯ)

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Ключевые слова: *Paramphistomum* spp., зараженность, крупный рогатый скот, Гвагвалада, Нигерия

РЕЗЮМЕ

В период с сентября 2017 г. по апрель 2018 г. на скотобойне Гвагвалада было проведено обследование забитого крупного рогатого скота для определения зараженности *Paramphistomum* spp. Стандартной инспекции мясопродуктов на наличие *Paramphistomum* spp. подвергнуто 648 особей. Найденных паразитов определяли при первичном обследовании и уточняли при микроскопировании. Общая зараженность крупного рогатого скота *Paramphistomum* spp. в период исследования составила 59.1 %, причем зараженность самцов была выше (51. 4%), чем самок (48.6 %). Статистически значимые различия ($P < 0.05$) в зараженности *Paramphistomum* spp. животных обнаружены в разные сезоны, а также в зависимости от их вида, пола и возраста. Наибольшее заражение крупного рогатого скота *Paramphistomum* spp. отмечено в октябре. Выявленный высокий уровень заражения животных *Paramphistomum* spp. свидетельствует об интенсивной трансмиссии этих паразитов в регионе, что может привести к огромным экономическим потерям. Поэтому животноводам рекомендуется улучшить обеспечение выращиваемых животных кормами, что позволит повысить их устойчивость к заражению *Paramphistomum* spp. При этом необходимо проводить комплексные мероприятия по селективной глистогонной терапии и борьбе с улитками – промежуточными хозяевами *Paramphistomum* spp.