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# Occurrence of gastrointestinal helminth infections in pigs sampled at Samaru, Zaria, Kaduna State, Nigeria

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**Abstract**

The domestic pig is reared in most parts of the world for meat, biomedical raw materials and manure. Helminthiasis has continued to constrain pig production in Nigeria due to abundance and interconnectivity of epidemiological factors and farm practices. Pigs are at risk of gastrointestinal worm infections due to their gluttonous appetite and omnivorous feeding habit. This study determined the occurrence of gastrointestinal helminth infections in pigs at Samaru, Zaria, Kaduna State, Nigeria, between the months of March to June, 2024. A total of 60 faecal samples were collected per rectum from pigs in three farms purposively selected based on owner approval and permission to carry out the study in their farms. All the pigs in each of the three farms involved in the study were sampled. The faecal samples were subjected to parasitological analysis using the simple flotation technique. Results showed overall helminth occurrence of 55% (33/60). Eggs of four helminth species were identified: *Oesophagostomum* spp. (13/60 = 21.7%) had the highest occurrence, followed by *Trichuris* spp. (12/60 = 20.0%), then *Ascaris* spp. (7/60 = 11.7%), and the least prevalent was *Globocephalus* spp. (1/60 = 1.67%). Age-based distribution of the occurrence of the helminth infections in the pigs sampled were: weaners – 10/21 (47.6%); growers – 15/27 (55.6%); and finishers – 8/12 (66.7%). A higher occurrence was recorded in females (20/31 = 64.5%) than in males (13/29 = 44.8%). The distribution of the occurrence of the helminths based on breed was as follows: Large White – 10/19 (52.6%); Hampshire – 2/3 (66.7%); Duroc – 7/11 (63.6%); Large Black – 2/4 (50.0%); Pietrain – 2/3 (66.7%); and Local breed – 10/20 (50.0%). It was concluded that the occurrence of helminth infections in the pigs sampled at Samaru Zaria, Nigeria was 55%, with eggs of *Oesophagostomum* and *Trichuris* species dominating, and finisher pigs and females having a higher occurrence.

**Keywords**: Pigs; Helminth infections; Cross-sectional survey; Occurrence; Samaru, Zaria, Nigeria.

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## Introduction

The domestic pig, *Sus scrofa domesticus*, is reared in most parts of the world for provision of meat (pork), biomedical raw materials and manure (FAO, 2015). Pork constitutes about 44% of meat consumed globally (FAO, 2015). Nigeria is the leading producer of pigs in the West African Sub-region, responsible for about nine million pigs, which represent 64.3% of the 14 million pigs reared in the Sub- region *(*Ajibo *et al.,* 2020). The polytocous nature, high feed conversion efficiency, early maturing nature, short gestation length and ability to thrive under sub-optimal conditions confers the pig with comparative advantages over other food animals (Nwanta *et al.,* 2011).

The Nigerian piggery industry is reportedly not thriving as expected, due partly to the endemicity and high burden of helminths that greatly limit productivity and profitability in swine production (Abonyi and Njoga*.,* 2020). Helminthiasis has continued to constrain pig production in Nigeria due to abundance and interconnectivity of epidemiological factors and farm practices that enhance the survival and transmission of helminth parasites (Ajibo *et al.,* 2020). Pigs are at risk of gastrointestinal worm infections due to their gluttonous appetite and omnivorous feeding habits, especially when farmers are ignorant of biosecurity practices, or do not prioritize them. Helminthiasis limits pig production and hence contributes to diminished animal protein production, especially in developing countries where the demand for animal proteins lags behind the supply (Njoga *et al*., 2018). Apart from the financial losses, some pig worms are zoonotic: *Ascaris suum* and *Ascaris lumbricoides* have been shown to spread from pigs to humans and vice versa (Peng and Criscione 2012).

Losses in the piggery industry due to intestinal parasites are enormous; it is important therefore to carry out an investigation on the prevalence of intestinal parasites of pigs, which will provide a base line information/data, and help in formulating development and extension programmes for communal/local farmers. In addition, knowledge of occurrence of particular parasite species will enable veterinary service personnel to devise prophylactic/therapeutic measures to reduce/eliminate helminths among pig herds and also understand possible public health threats associated with zoonotic helminths. The present study identified and determined the occurrence of gastrointestinal helminths of pigs sampled in Samaru, Zaria, Kaduna State, Nigeria.

## Materials and Methods

**Study Area:** This study was done in Samaru, Zaria, Kaduna State, Nigeria. Samaru, Zaria is located within latitude of $11^{o}$4N and longitudes $7^{o}$42E, with a population of 408,198 as at 2006 census. It is characterized by a tropical climate with two main seasons; a rainy season (May to October) and a dry season (November to April) with Guinea Savanna vegetation (Agbogu *et al*., 2006). The monthly mean temperature ranges from $13.8^{o}$ to $36.7^{o}$C and an annual rainfall of 1092.8mm (Agbogu *et al*., 2006). Approximately 40 – 75% of the population's livelihood is based on agriculture (ABU, 2000).

**Sampling procedure:** The pigs used for the study were from three farms in Samaru, Zaria whose owners permitted that the study be carried out in their farms. One of the farms had exotic breeds of pigs only (n = 40), while the other two which were backyard farms had local breeds of pigs (n = 20). All pigs in the three farms were sampled. Sixty faecal samples were collected per rectum from the pigs following proper restrain. The pigs were grouped into three age groups: weaners (0 – 3 months), growers (3 – 6 months) and finishers (6 month and above). Their sexes were also determined.

**Faecal sample collection:** Following physical examination under proper restraint, faeces were collected from the rectum of the pigs with gloved hands. The faeces were transferred into well labeled polythene bags and transported inside a cold box to the Helminthology Laboratory of the Department of Veterinary Parasitology and Entomology, Ahmadu Bello University (A.B.U) Zaria immediately, for processing and examination.

**Processing of the faecal sample:** The faecal samples were analyzed using simple floatation technique as described by Zajac and Conboy (2006). Briefly 2 – 3g of faeces was placed unto a centrifuge tube and floatation media (zinc sulphate solution) was added and mixed thoroughly. The zinc sulphate solution composed of 380 g of zinc sulphate dissolved in 1000 ml of distilled water, and the specific gravity was 1.18. The faecal sample-zinc sulphate solution mixture was then sieved through a gauze and funnel unto a different centrifuge tube. Floatation media was added to the second centrifuge tube until it formed a convex meniscus and then a coverslip was placed at the top. It was allowed to stand for 15 minutes so that the eggs can float to the top and adhere to the cover slip. The cover slip was removed and gently placed on a clean glass slide and viewed under ×10 and ×40 objective lens of a light microscope for the presence or absence of helminth eggs. (Zajac and Conboy, 2006).

**Data Analysis:** Data obtained were analyzed using Statistical Package for Social Sciences (SPSS) software, Version 20.0, IBM USA 2011. The percentage occurrence of helminth egg species was calculated as number of pigs infected with a particular helminth species divided by the number of pigs examined multiply by 100. Chi-square test was used to test for association between the occurrence of helminth eggs and variables such as, age, sex and breed. Probability values of $p < 0.05$ was considered significant

## Results

Out of the 60 faecal samples examined, 33 were found to be infected, with an overall occurrence of 55%. Eggs of four helminths were identified, as follows: *Oesophagostomum* spp. – 21.7% (13/60); *Trichuris* spp – 20.0% (12/60); *Ascaris* spp – 11.7% (7/60); and *Globocephalus* spp - 1.7% (1/60) (Table 1).

Table 2 shows the occurrence of gastrointestinal helminth eggs based on the age of pigs examined. Out of the 21 weaners examined, 10 (47.62%) were infected with helminths; 15 out of the 27 growers (55.6%) and 8 out of the 12 finishers (66.7%) were infected with helminths. There was no significant association ($p > 0.05$) between the occurrence of helminths and age.

**Table 1**. Overall occurrence of gastrointestinal helminth eggs in pigs sampled at Samaru, Zaria, Nigeria.

| Helminth egg type | Number of pigs examined | Number positive | Occurrence (%) |
|---|---|---|---|
| ***Oesophagostomum*** | 60 | 13 | 21.7% |
| ***Trichuris*** | 60 | 12 | 20.0% |
| ***Ascaris*** | 60 | 7 | 11.7% |
| ***Globocephalus*** | 60 | 1 | 1.7% |
| **Total** | 60 | 33 | 55% |

**Table 2.** Occurrence of gastrointestinal helminth eggs in pigs sampled at Samaru, Zaria, Nigeria, based on age of the pigs.

| Age groups | Number of pigs examined. | Number positive | Occurrence (%) |
|---|---|---|---|
| **Weaners** | 21 | 10 | 47.6% |
| **Growers** | 27 | 15 | 55.6% |
| **Finishers** | 12 | 8 | 66.7% |
| **Total** | 60 | 33 | |

**Table 3.** Occurrence of gastrointestinal helminth eggs in pigs sampled at Samaru, Zaria, Nigeria, based on sex.

| Sex | Number of pigs examined. | Number positive | Occurrence (%) |
|---|---|---|---|
| **Females** | 31 | 20 | 64.5% |
| **Males** | 29 | 13 | 44.8% |
| **Total** | 60 | 33 | |

**Table 4.** Breed-based distribution of occurrence of gastrointestinal helminth eggs in pigs sampled at Samaru, Zaria, Nigeria.

| Breed | Number of pigs examined. | Number positive | Occurrence (%) |
|---|---|---|---|
| **Large White** | 19 | 10 | 52.6% |
| **Hampshire** | 3 | 2 | 66.7% |
| **Duroc** | 11 | 7 | 63..6% |
| **Large Black** | 4 | 2 | 50.0% |
| **Pietrain** | 3 | 2 | 66.7% |
| **Local breed** | 20 | 10 | 50.0% |
| **Total** | 60 | 33 | 55.0% |

Female pigs had a higher occurrence of helminths infection (20/31 = 64.5%) than males (13/29 = 44.8%) (Table 3). No significant association ($p > 0.05$) was found between the occurrence of helminths and sex.

Table 4 shows the distribution of occurrence of gastrointestinal helminth eggs based on breed of pigs examined: Large White 10/19 (52.6%); Hampshire – 2/3 (66.7%); Duroc – 7/11 (63.6%); Large Black – 2/4 (50.0%); Pietrain – 2/3 (66.7%); and Local breed – 10/20 (50.0%). In terms of breeds, the Hampshire and Pietrain breeds had the highest and equal occurrence of 66.67%, and there was also no significant association ($p > 0.05$) between occurrence of the helminths and breed.

**Discussion and Conclusion**

The overall occurrence of 55% recorded in the present study for gastrointestinal helminths in the pigs sampled is nearly similar to the earlier prevalence reports of 50% by Nwoha and Ekwurike (2011) in pigs in Umuahia, Abia State, Nigeria, and 51.1% reported by Sachin *et al* (2016) in Mumbai area, India. The 55% recorded in the present study was however lower when compared to 61.5% prevalence of gastrointestinal parasites recorded by Karaye *et al.* (2016) in Plateau, Nigeria, and 62.85% by Cyprian *et al.* (2022) in Ibadan, Nigeria. The 55% occurrence recorded in the present study is higher when compared to 24.1% reported by Wosu (2015) in confined pigs in Nsukka; 42.7% by Amadi *et al.* (2018) in Umuahia North Local Government Area of Abia State, and 28.4% by Sharma *et al.* (2020) in Ibadan, Nigeria.

The high prevalence (55%) recorded in this study may be attributed to poor animal husbandry and biosecurity measures in piggeries in the study area. The differences in prevalence of helminths may also be due to differences in environmental conditions, husbandry practices, stocking rate, nature of their diets, breeds and inherent characteristics such as host immunity in the study regions (Kumar, *et al.,* 2002). The higher infection rate in this study could also be attributed to possible lack of deworming of the pigs and poor sanitation. It could also possibly be because of misuse of anthelmintics among pig farmers leading to resistance to commonly used anthelmintics.

Eggs of four helminth species of veterinary importance were recorded in the present study: *Oesophagostomum*, *Trichuris*, *Ascaris* and *Globocephalus* species. The helminth eggs identified in this study are the common parasites of swine. The higher occurrence of *Oesophagostomum* eggs as recorded in this study is in agreement with the findings of Atawalna *et al. (*2016) in Ejisu municipality, Ghana. These findings are similar to reports of occurrence of helminth parasites of swine by previous authors. The higher but non statistically significant occurrence recorded in female pigs relative to the males, concurs with the reports of Cyprian *et al.* in Ibadan, and Atawalna *et al.* (2016). Nsoso *et al*. (2000) in Botswana and Zewdneh *et al*. (2013) reported that, there was no significant association between sex and prevalence of helminths in pigs, which agrees with the present study. According to Sangioni *et al*. (2017), higher parasitic infestation in females could be the result of the peculiarities of their physiological status or reproductive function (pregnancy, parturition, and lactation), which can potentially weaken the immune system thereby making the animals prone to parasitic infection. Maganga *et al.* (2019) further explained that female animals, particularly during late pregnancy and lactation, are highly susceptible to parasitic infection due to hormonal alterations that lower the resistance to nematodes which results in higher infections. The higher occurrence recorded in females in the present study contrasts with the findings of Dadas *et al.* (2016), Sowemimo *et al.* (2012) and Adhikari *et al.* (2021) who reported higher parasitic burden in males than in females. According to Li *et al.* (2020), variations in the prevalence rate obtained from different studies could be explained by factors including detection procedures utilized, sample size, farm management, climatic variations and the immune status of an animal. The higher rate of gastrointestinal infestation in females could also have arisen from the longer period in which breeding sows are allowed to stay in the farm as against the boars that are fattened, sold off, and replaced periodically (Akanni *et al.,* 2017).

Although there was no significant difference between age groups, the finishers had a higher prevalence than the growers and weaners; this is in agreement with the finding of Atawalna *et al.* (2016). The higher prevalence

in finishers (adults) than in growers and piglets is probably due to prolonged exposure of adults to infective stages of nematodes, and this is attributed to the fact that adult pigs have longer exposure to helminth parasites due to their age. On the contrary, some researchers (Roesel *et al.,* 2017; Maganga *et al .,*2019), reported higher prevalence in young pigs than the old, and attributed this lower infestation rate in adult pigs as a result of established immunity after the first infection. However, Corwin (1997) reported that adult pigs had acquired a more effective immune memory over time hence the low helminth occurrence in adults.

The differences in occurrence of helminths among the breeds in this study may be due to differences in the inherent characteristics such breeds, as host immunity may vary from breed to breed (Kumar, *et al.,* 2002). The lack of significant difference in occurrence between the breeds may also be attributed to the fact that most of the pigs examined were kept together and managed on intensive system of management which could be as a source of spreading the infection to the others by the carriers among them. The lowest prevalence rate was recorded in the local breed: this corroborates the reports of Zanga *et al.* (2003), who reported that local pigs have been demonstrated to be less susceptible to endoparasites than exotic breeds.

In conclusion, the occurrence of helminth infections in the pigs sampled at Samaru, Zaria, Nigeria was 55%, with eggs of *Oesophagostomum* and *Trichuris* species dominating, and finisher pigs and females having a higher occurrence.

## Conflict of interest

The authors declare no conflict of interest.

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