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Investigations on gastro-intestinals of Swine in Bwari, federal capital territory, Nigeria

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Abstract

The gastrointestinal (GI) health of swine is a significant determinant of their overall well-being, growth performance, and productivity. This study was aimed at determining prevalence and species diversity of GI parasites of swine (*Sus scrofa*) in Bwari Area Council, of the Federal Capital Territory (FCT). About 5 g faecal samples each was collected from 120 domestic pigs, (58 male and 62 female), in randomly selected farms in the study area and, were analysed for GI parasites using standard flotation and sedimentation techniques. The results showed that 51 (42.50%) were infected with various GI parasites. The species encountered includes; *Ascaris* sp (32.29%), *Oesophagostomum* sp (17.64%), *Strongyloides* sp (13.73%), *Metastrongylus* sp (13.73%), *Paragonimus* sp (7.84%), *Stephanurus* sp (5.88%), *Trichuris* sp (3.92%) and, Oocysts of coccidia (25.49%) respectively. Breed-wise prevalence of infection showed local breeds had 14/28 (50.00%), exotic breed 15/32 (46.78%), and crossbreed 22/60 (36.67%). Sex-wise infection prevalence revealed 33/58 (56.90%) male and 18/62 (29.03%) female. Age-wise prevalence of infection showed adult pigs (>12 months) 31/57 (54.39%) and piglets (≤12 months) 20/63 (31.75%). Age and sex showed statistically significant difference ($P<0.05$). This study found that the pigs under investigation had a comparatively high prevalence of gastrointestinal parasite infections, which have a detrimental effect on their production and general well-being. Therefore, targeted management and intervention strategies should be considered to reduce their prevalence, and enhance the overall sustainability and profitability of swine farming in the area.

Keywords: Gastrointestinals; Swine; Prevalence; Bwari; Federal Capital Territory; Nigeria

1. Introduction

Swine farming is a competitive and heavily mechanized industry that is practiced globally, especially in Nigeria. Domestic pigs are mainly raised for their meat, known as pork, with their bones, hide, and bristles also utilized in various commercial products. Swine farming is a major source of both food and cash for many people. Gastrointestinal parasites cause significant productivity loss in the swine industry and other livestock sectors. Swine can also harbor parasitic diseases that are detrimental to humans. Despite often being asymptomatic, farmers should acknowledge their existence and the associated losses [1]. Livestock plays a crucial role in Nigeria not only for its economic benefits but also due to the significant involvement of more than 80% of the population in agriculture [2]. The livestock sector's contribution to Nigeria's GDP has been increasing, with a 2.3% growth in the second quarter of 2023 [3]. Many helminth parasites that impact pigs in different regions have been reported. Animals infected with helminth parasites may experience low performance, this can be primarily due to their propensity to predispose to secondary infections usually caused by opportunistic pathogens, inefficient feed conversion, poor growth rate, reduced weight gain, and the condemnation of infected organs following slaughter [4]. The economic losses linked to gastrointestinal parasitic infections stem from decreased feed efficiency, a decrease in the litter size, reduced offspring weight, lower weaning

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weight, diminished fertility, and disruption of the immune system's response to the vaccine [5]. Gastrointestinal parasites commonly affect swine farming at various stages of production, such as the protozoan organisms *Cystoisospora suis* [6] and *Cryptosporidium* spp. The most common helminth parasites are the nematodes, *Ascaris suum* [5] and those of the order Strongylida, such as *Trichostrongylus axei*, *Hyostrongylus* spp. and, *Oesophagostomum* spp. [5]. Adequate management techniques are necessary to lessen the possible adverse effects of parasites in a swine herd. Control is accomplished by using antiparasitic medications in conjunction with strategic management practices.

In Nigeria, several studies had been carried out, such as in Nsukka (Southeast) agricultural zone and, had revealed high prevalence of gastrointestinal parasite infection in intensively managed pigs, with factors such as inadequate feeding practices and lack of deworming programs contributing to the occurrence [7]. Similarly, a study in Edo State (South-south), highlighted parasitic diseases as a major challenge for swine breeding, reporting a prevalence of 86.6% [8]. In Ghana, reports from Tolon and Kumbungu districts showed a high prevalence of gastrointestinal parasites in pigs under two years old, emphasizing the importance of efforts to reduce transmission due to public health concerns [9]. Additionally, findings from Ibadan, Oyo State (Southwest), revealed parasite prevalence of 33% in pigs, with nematodes as the most common [10]. These studies underscore the significance of managing gastrointestinal parasites in pigs to enhance production and minimize zoonotic risks. There is lack of comprehensive data on the occurrence and impact of gastrointestinal parasites in swine populations in the federal capital territory. This study therefore aimed to provide epidemiological data on GI parasites of swine in the contribution to improving their welfare and sustainable farming practices in Bwari Area Council, of the FCT.

2. Materials and methods

2.1. Study area

The study was carried out in the Bwari Area Council, which is one of the six Area Councils in the FCT. It is geographically located between Latitudes 6°45' and 7°45' north and Longitudes 8°25' and 9°35' East, covering a total area of about 2,300 square kilometres and lies in the North-Eastern part of the Federal Capital Territory [11]. It has a population of over 227,216 persons [12]. Bwari Area Council in the FCT, experiences a tropical climate characterized by two main seasons: a rainy season from April to October and, a dry season from November to March. Temperatures typically range from 15°C to 34°C (59°F to 93°F), with high humidity levels during the rainy season.

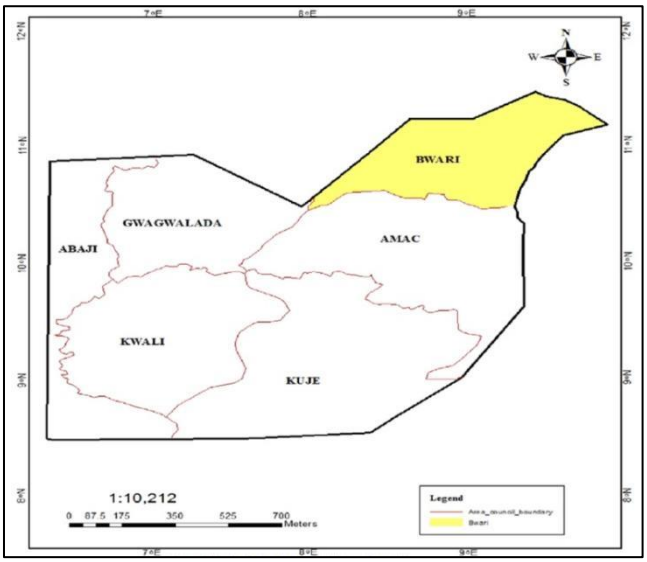

Figure 1 Map of Abuja showing Bwari Area Council [11]

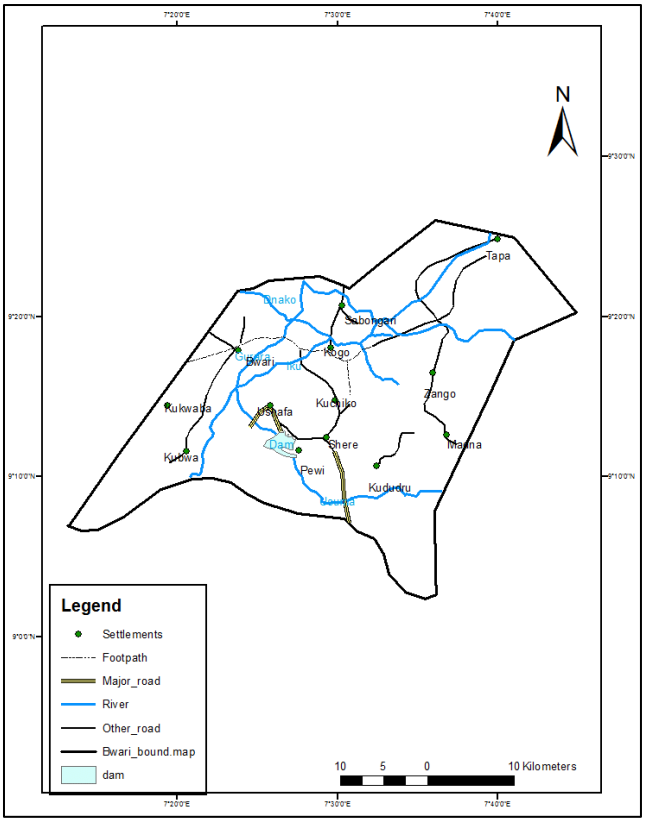

Figure 2 Map of Bwari Area [11]

2.2. Study design

A cross-sectional study design was employed. A total number of 120 swine were sampled for faeces from randomly selected farms in Bwari Area Council. This study was carried out between September - October 2024. The characteristics of the pigs such as age, breed, and sex were recorded.

2.3. Faecal sample collection

About 5 g of faeces each was collected from (n=120) swine per-rectum or from freshly voided faeces and placed into a clean, sample container with 10% formalin. Each sample was appropriately labeled and, transported to the Parasitology Laboratory of the Faculty of Veterinary Medicine, University of Abuja, for analysis.

2.4. Floatation technique

The flotation method was carried out as described in (TroCCAP, 2023) [13]. The method is effective for detecting and, recovering most nematode, tapeworm eggs, and protozoan cysts and Oocysts of coccidia in swine faeces. A flotation medium used was prepared by dissolving 150 grams of salt and 454 grams of sugar in 380 milliliters of water, resulting in a specific gravity of approximately 1.27. Using a mortar and pistol, the faeces was well macerated and the flotation media was then added, and well mixed. A cover slip was carefully placed on top of the test tube after the faeces suspension had been filtered through a strainer into a test tube until a positive meniscus was formed. The cover slip was carefully removed from the tube, after standing for 10-15 minutes and, then placed on a glass slide and viewed under an X400 magnification.

2.5. Centrifugal Sedimentation technique

A sedimentation method was carried out as described in [13]. It is employed for the isolation and recovery of all helminth ova, including trematode, offering high sensitivity as trematode eggs are slightly heavier than other helminth ova. In this technique water is used instead of floatation fluid. About 1-2 g of faeces was emulsified in water in a pestle and mortar. The mixture was filtered using a strainer into a conical test tube and centrifuged at 2500 rpm for 1-2 minutes, after which the supernatant was carefully discarded, 1-2 drops of the sediment was transferred onto a microscopic glass slide, and a cover-slip placed on top and carefully examined using a light microscope.

2.6. Data analysis

Data generated from this study were summarized in percentages and analyzed using Statistical Package for Social Sciences (SPSS) version 20 and, were further presented in tables. Chi-square (X^2) analysis was also carried out to evaluate the association between variables.

3. Results

3.1. Prevalence of gastrointestinal parasites

Out of the 120 faecal samples of swine examined for gastrointestinal parasitic infection, 42.50% (51/120) were infected with one or more parasite species. A total of eight (8) parasite species were encountered in this study comprising (6) nematodes, (1) trematode, and Oocyst of coccidia parasites. These include *Ascaris* 18(35.29%), *Oesophagostomum* 9(17.64%), *Strongyloides* 7 (13.72%), *Metastrongylus* 7 (13.72%), *Stephanurus* 3 (5.88%), *Trichuris* 2 (3.92%) for nematodes parasites, *Paragonimus* 4 (7.84%) for trematode and Oocyst of coccidia 13 (25.49%) (Table 1).

Table 1 Distribution of gastrointestinal parasites of swine in Bwari Area Council.

Parasites	Number infected	Prevalence (%)
Ascaris	18	35.29
Oesophagostomum	9	17.64
Strongyloides	7	13.73
Metastrongylus	7	13.73
Stephanurus	3	5.88
Trichuris	2	3.92
Paragonimus	4	7.84
Oocysts of coccidia	13	25.49
Total	51	42.50

3.2. Sex -wise prevalence of gastrointestinal parasites

Table 2: showed that Boars had a higher prevalence of 33 (56.90%) than Sow with 18 (29.03%). There was a statistically significant difference between sex and infection rate ($P<0.05$). The odd ratio showed infection rate as 3x in Boar than in Sow.

Table 2 Sex-wise distribution of gastrointestinal parasites of swine in Bwari Area Council.

	No. sampled	Infected	Non-infected	Prevalence (%)
Male	58	33	25	56.90
Female	62	18	44	29.03
Total	120	51	69	42.50

$X^2= 9.521$, $p= 0.002$, OR= 3.227

Table 3 showed that older swine (>12 months) had a higher prevalence of 54.31% (31/57) than the piglets (≤12 months) with (31.75%) 20/63 (Table 3). There was a statistically significant difference between age and infection rate ($P<0.05$).

Table 3 Age-wise distribution of gastrointestinal parasites of swine in Bwari Area Council.

	No. sampled	Infected	Non-infected	Prevalence (%)
Young	63	20	43	31.75
Adult	57	31	26	54.39
Total	120	51	69	42.50

X^2= 6.277, p= 0.012, OR= 0.39

3.3. Breed-wise prevalence of gastrointestinal parasite

Table 4 showed that local swine had the highest (50%) infection rate, followed by exotic breed (46.88%) and, cross breed had the lowest (36.67%) infection rate (Table 4). There was no statistically significant difference recorded among the breed (P<0.05).

Table 4 Breed-wise distribution of gastrointestinal parasites of swine in Bwari Area Council Abuja.

Breed	No. sampled	Infected	Non-infected	Prevalence (%)
Exotic breed	32	15	17	46.88
Local breed	28	14	14	50.00
Cross breed	60	22	38	36.67
Total (%)	120	51	69	42.50

X^2= 1.731, p= 0.421

3.4. Single and multiple infections

From the total 51 (42.50%) pigs infected, 39 (76.47%) had a single infection comprising of 11(28.21%) of *Ascaris* sp, 6 (15.38%) of *Oesophagostumum* sp., 5 (12.82%) of *Strongyloides* sp., 5 (12.82%) of *Metastrongylus* sp., 2 (5.13%) of *Stephanurus* sp., 1(2.56%) of *Trichuris* sp., 3 (7.69%) of *Paragonimus* sp., 6 (15.38%) of Oocysts. Moreover, mixed infections recorded were 12 (23.53%); *Ascaris* sp. and oocysts 3 (25.00%) *Oesophagostumum* sp. and oocysts 2 (16.67%), *Ascaris* sp. and *Metastrongylus* sp. 2 (16.67%), *Oesophagostumum* sp. and *Ascaris* sp. 1 (8.33%), *Strongyloides* sp and oocysts 1 (8.33%), *Trichuris* sp. and oocysts 1(8.33%), *Ascaris* sp. and *Strongyloides* sp 1(8.33%), *Stephanurus* sp. and oocysts 1 (8.33%) respectively.

4. Discussion

The gastrointestinal tract (GIT) plays a central role not only in digestion and nutrient absorption but also in immune defense, underscoring its importance for overall animal health and productivity [14] The reported prevalence of helminth infections in this study was significantly lower than 86.6% reported from Benin City, Edo state, Nigeria [8] and 84.6% from Rwanda [15]. This may be attributed to efficient farm management practices, such as improved regular pen cleaning and disinfection, providing high-quality feed, provision of veterinary services and biosecurity measures. Existing reports showed that gastrointestinal parasite prevalence is generally much lower in intensive system of pig farming [16].

Three species of *Ascaris*, *Stephanurus*, and *Trichuris* were among the gastrointestinal parasites found in this study, which had a higher number of species than the five previously described in Ibadan [17]. This study revealed that *Ascaris* sp. had the highest prevalence, which is in consistent with findings from other studies in Nigeria and across Africa [18,19] (Nwosu *et al*., 2014; Obebe et al., 2020), then followed by *Oesophagostomum* sp. at 17.64%. This is in contrasts with previous studies where *Oesophagostomum* sp. was reported as the most prevalent parasite [20]. *Ascaris* sp. is relatively common because female worms are very prolific, laying a lot of eggs per day that quickly contaminate the environment. These eggs are notably resilient to environmental stressors and can remain viable for years under favorable conditions. These findings are consistent with Tamboura *et al*. [21] , that reported *Ascaris suum* as the most common parasite in both scavenging and semi-intensively managed pig populations. The detection of *Metastrongylus* sp. (lungworms) is particularly noteworthy, as it suggests that pigs may come into contact with the parasite intermediate hosts such as earthworms, that harbour the infective larvae [22]. The presence of *Paragonimus* sp. at 7.84% prevalence is also important, given the zoonotic potential of this lung flukes, which can infect humans through the consumption of under-cooked pork [23]. *Stephanurus* sp., a kidney worm

that also infects the intestines of swine, was identified in this study but with relatively low occurrence. It showed a prevalence of 2.56% in single infections and 8.33% in co-infections, making it the least common parasite recorded. According to Soulsby [24] (1982), pigs can acquire this parasite via multiple routes, including ingestion of infective larvae, skin penetration, or consumption of infected earthworms.

This study revealed variations in parasite infection rates among different pig demographics factors considered. Boars showed a notably higher prevalence of infection compared to sow, which is consistent with findings by Dadas *et al*. [25] (2016), who reported prevalence rates of 28.15% in males and 22.96% in females, as well as Sowemimo *et al*. [17], who reported higher prevalence in boars (18.0%) than in sows (7.0%). Conversely, these results differ from that of [26] Dey *et al*. (2014), who recorded a higher prevalence of endoparasites in sows (100%) compared to boars (93.9%). The slightly elevated parasite prevalence among boars in this study may be due to differences in management practices, hormonal influences, or feeding behaviors. Although sex-based differences in parasite prevalence have been reported in other studies, the exact mechanisms are not fully understood and likely depend on the specific parasite species and environmental context [27] (Vlassoff & Bondy, 1994).

Age-wise related differences in GI parasite infection rates were also evident, with adult pigs (> 12 months) exhibiting a higher prevalence than younger pigs. This finding is consistent with previous research, such as Dey *et al*. [26] (2014), who reported infection rates of 100% in adult pigs and growers, compared to 90.5% in piglets. However, these results contrasted that of Sarker *et al*. [28] (2016), who reported a 100% infection rate across all age groups, including adults, growers, and piglets. The elevated prevalence observed in adult pigs in this study could be a reflection of cumulative exposure to infective stage of the parasites over time, as well as age-wise related changes to immune response [29] (Kahn *et al*., 2019). Nonetheless, it is important to note that young pigs also showed substantial infection rates, indicating that parasitic infections represent a significant health concern across all age categories.

Breed-wise differences in infection prevalence was also observed. Local breeds exhibited the highest infection rates, followed by exotic breeds and then the crossbreeds. These variations may be influenced by differences in management practices, genetic resistance, or environmental factors associated with each breed. The elevated prevalence in local breeds could be related to less intensive husbandry and limited access to veterinary care compared to exotic and crossbred pigs [15] (Katakam *et al*., 2016).

This investigation also showed that among the pigs examined, both single and multiple parasite infections were encountered.

Single infections were more common, accounting for 76.47% of infected pigs, while mixed infections constituted 23.53%. Multiple infections may suggest that certain pigs are more susceptible to parasite loads, which can worsen the effects on their production and health [30].

5. Conclusion

This study demonstrated a notablyy high prevalence of gastrointestinal parasites infections among swine in Bwari Area Council, with several parasite species identified. Age and sex were found to significantly influence the occurrence of gastrointestinal parasites in the sampled pigs. These findings underscore the importance of adopting improved management practices, implementing regular deworming schedules, and strengthening biosecurity measures to effectively control parasitic infections and enhance swine health and productivity.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no competing interests.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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