Journal of Veterinary Research Advances
ISSN: 2582-774X

Research Article
Open access

Survey for gastrointestinal parasites of pigs within farms located in Jos Metropolis, Plateau State, Nigeria

Lekko YM[1*], Chinda H[1], Unanam ES[2], Ijoh BB[3] and Midala CA[3]

[1]Department of Veterinary Medicine, Faculty of Veterinary Medicine, University of Maiduguri, Borno State, Nigeria
[2]Departments of Veterinary Medicine, Surgery and Radiology, University of Jos, Plateau State, Nigeria
[3]Departments of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, University of Maiduguri, Borno State, Nigeria

Corresponding author: ymlekko@unimaid.edu.ng

Received on: 21/06/2025 Accepted on: 01/12/2025 Published on: 07/12/2025

ABSTRACT

Aim: Main purpose of the study was to identify the common important gastro-intestinal parasites of pigs predominant in the production areas within Jos metropolis, Plateau state, Nigeria.

Method and materials: Hundred fecal samples with twenty (20) from each of the five different farm (Farm A, B, C, D and E) that comprised of four different breeds (Large white, Duroc breed, Hamsphire breed and Landrace Breed). The samples were subjected to fecal floatation technique and prevalence was determined using epitools.

Results: Adults and neonates were having a prevalence of 90% and 85% respectively while weaners and growers were having the prevalence of 60% and 70% respectively. The Hampshire breeds showed highest prevalence of 18(90%), followed by Landrace breeds 16(80%), large white breeds 29(72.5%), and duroc breeds 14(70%). A total of 9 parasites eggs were isolated from 100 faecal sample examined, with a prevalence of Ascaris lumbricoides 23(23%), Bourgelatia didacta 14(14%), Paragonimus westermanii 13(13%), Stephanurus dentatus 12(12%), Fasciolopsis buski 11(11%), Metastrongylus apri 8(8%), Oesophagostomum dentatum 5(5%), Macracanthorhyncus hirudinaceus 2(2%), Necator Spp 2(2%). Differences in GI parasites may be due to husbandry systems, breed, season, nutrition status, availability of veterinary services, health status of breeders or replacement stocks and total number of samples examined.

Conclusion: It was concluded that poor management practices and climatic factors may have favoured the endemicity and proliferation of the parasites resulting in high prevalence of gastrointestinal parasites. This calls for drastic preventive and control measures gastrointestinal parasites to boost pig production and reduce public health consequences.

Keywords: Gastrointestinal parasites, fecal sample, pigs, prevalence

Cite This Article as: Lekko YM, Chinda H, Unanam ES, Ijoh BB and Midala CA (2025). Survey for gastrointestinal parasites of pigs within farms located in Jos Metropolis, Plateau State, Nigeria. J. Vet. Res. Adv., 07(02): 30-35.

Introduction

The suidae family in which domestic pig is a member is being reared in many parts of the world. The business of pig farming is being conducted in southern part of Nigeria as a small holder family business (Onunkwo et al. 2011). In African societies livestock ownership is regarded as a measure of financial wealth and for solving family problems (Ekere et al. 2018). Pig production is an important part of rural economy where it provides animal protein, generating employment and reducing poverty (Akanni et al., 2017). Globally pork meat contributes about 40% of meat consumed (Karaye et al., 2016).

In Nigeria, pigs are kept for pork production, to meet the high demand due to rapidly growing population (Njoga et al. 2018a), it's been estimated at 200 million with 2.6% annual growth rate (Worldometers, 2019). Nigeria's average per capita daily protein intake (45.4 g) is lower than the FAO minimum recommendation of 65 g per day (FAO 2002; Abonyi et al., 2012; Abiodun et al., 2017) as a results of insufficient production and high cost of animal protein. Although pig farming can reduce the wide gap between demand and supply of animal protein in Nigeria, but this was not possible because of heavy burden of gastrointestinal parasites that have negative impact on productivity and profitability in pig production (Aliaga-Leyton et al., 2011). Gastrointestinal parasites infection has been a major constraint to pig farming in Nigeria due several factors that favour pathogen survival and proliferation in the tropics (Njoga et al. 2018b; Okoli et al. 2018). Following infestation with gastrointestinal parasite, clinical signs mostly observed are in-appetence and diarrhoea. As the infection progress, the parasite competes with the host for available nutrients, leading to unthriftiness, emerciation, anaemia, and eosinophilia. Substantial parasitic infection can result to irritation of the upper gastrointestinal tract or blockage of small intestine and bile duct; leading to emesis, icterus in young pigs and even death on eventual rupture of the intestine. Sometimes, immunosuppression ensues, thereby worsening the health condition of the infested pigs by predisposing them to plethora of other infections and possible deaths (Jufare et al., 2015).

Other signs manifested by pigs are anorexia and poor feed conversion rate, result in delay in maturity or attainment of market weight. In addition to high morbidity and mortality associated with parasitic infection causing substantial economic losses due to cost of antihelminthics drugs and veterinary services during treatment. Un-thriftiness noted among infested pigs (Jatfa et al. 2019) translates to economic loses as the animals are reared and fed longer than usual. Furthermore, the worms may damage visceral organs, resulting in financial losses due to condemnation of damaged organs or carcasses during meat inspection.Despite profuse reports on prevalence of GIP infection in pigs in other parts of Nigeria (Nwoha and Ekwurike, 2011; Sowemimo et al., 2012; Okorafor et al., 2014; Karaye et al. 2016; Akanni et al., 2017; Obisike et al., 2018; Lekko et al., 2018; Jatfa et al., 2019), there is dearth of published data on GIP infection in pigs in Jos metropolis (Akanni et al., 2017). Therefore, the current study was designed to identify the common important gastro-intestinal parasites of pigs predominant in the production areas within Jos metropolis, Plateau state, Nigeria.

Materials and Methods

The study was conducted within Jos metropolis, a city that is located in the Middle Belt of Nigeria located between latitudes 90 54′ N and 100 10′ N and longitudes 80 48′ E and 90 30′ E (Andesikuteb et al., 2020). The area extent of Jos metropolis, from north to south is 104km while from east to west is about 80km on an elevation of 1,250m above sea level, with Shere Hills having the highest peak of 1,777m above sea level, and an area of 1002.19 Km2 (Mohammed et al., 2010). The city has a population of about 900,000 residents based on the 2006 census.

Laboratory equipment's

The list of materials that was used during course of research for faecal collection and faecal concentration was as follows: plain sample container, disposable hand gloves, face mask, beaker, mortar and pestle, sieve, bijou bottle, cover slip, glass slide, physiological saline (concentrated salt solution), and microscope.

Faecal Sample Collection:

Faecal samples were collected from each pig using a disposable polythene hand gloves from five different farms (20 sample each), which were labelled as Farm A, Farm B, Farm C, Farm D and Farm E (WHO, 2003, Ngowi, et al., 2004, Stefanie et al., 2021), and transported in an ice pack to the department of veterinary medicine laboratory, University of Maiduguri, Borno State, Nigeria.

Feacal analysis

The faecal samples were grossly examined for presence of adult parasite. Microscopic Examination was also carried out using Floatation techniques (Hansen, et al., 1990, Parameshwarappa et al., 2012). The technique was carried out as follows: a fresh faecal sample of 2–3 grams was mixed gently using a pestle and mortar with a physiological solution (saturated salt solution); it was then sieved using a sieve into a floatation bottle (Bijou bottle), which was filled to the brim and was covered with a cover slip for 15–20 minutes. The cover slip was removed and placed on a clean glass slide. It was put under a light microscope and viewed at a microscopic magnification of 100mm.

Statistical Analysis

Prevalence and 95% CI were calculated using Epitools Epidemiological Calculators (Sergeant, ESG, 2018).

Results and Discussion

Prevalence of gastrointestinal parasites according to different age groups and pig farms within Jos Metropolis: Out of 100 fecal sample examined, an overall prevalence of 0.77 (77%) was recorded for GIP infestations at different farm levels, within Jos Metropolis for intensively managed pigs. Our result shows that, the adults and the neonates are having a prevalence of 90% and 85% respectively while the weaners and the growers are having the prevalence of 60% and 70% respectively (Table 1).

Breed distribution of polyparasitism in pigs within Jos Metropolis: The Hampshire breeds have the highest prevalence of 18(90%), followed by Landrace breeds 16(80%), large white breeds 29(72.5%), and duroc breeds 14(70%). The four breeds had a single parasitism of 59(59%), out of 100 faecal sample examined, duplet parasitism of 14(14%) and the triplet parasitism of 4 (4%) (Table 2).

Prevalence of parasitic nematodes according to species identified from screened faecal samples: A total of 9 parasites eggs were isolated from 100 fecal sample examined, with a prevalence of *Ascaris lumbricoides* 23(23%) *Bourgelatia didacta* 14(14%), *Paragonimus westermanii* 13(13%), *Stephanurus dentatus 12(12%), Fasciolopsis buski* 11(11%), *Metastrongylus apri* 8(8%), *Oesophagostomum dentatum* 5(5%), *Macracanthorhyncus hirudinaceus* 2(2%), *Necator Spp* 2(2%) (Table 3).

Table 1. Prevalence of gastrointestinal parasites according to different age groups and pig farms within Jos Metropolis

Sample (n=20)	Sample Size	No Infected	Prevalence (%)	Lower 95% CI	Upper 95% CI
Farm A (Weaners)	20	12	0.6 (60)	0.3866	0.7812
Farm B (Growers)	20	14	0.7 (70)	0.481	0.8545
Farm C (Adults)	20	18	0.9 (90)	0.699	0.9721
Farm D (Neonates)	20	17	0.85(85)	0.6396	0.9476
Farm E (Mixed)	20	16	0.8 (80)	0.584	0.9193
Total	100	77	0.77 (77)	0.6785	0.8416

Table 2. Breed distribution of polyparasitism in pigs within Jos Metropolis

Type of parasitic infestation	Large White Breed (40)	Duroc breed (20)	Hampshire breed (20)	Landrace Breed (20)	Total Prevalence (%)
Single (95%CI)	21(52.5%) (0.375-0.6706)	12(60%) (0.3866-0.7812)	14(70%) (0.481-0.8545)	12(60%) (0.3866-0.7812)	59(59%) (0.492-0.6813)
Duplet (95%CI)	7(17.5%) (0.0875-0.3195)	2(10%) (0.0279-0.301)	3(15%) (0.0524-0.3604)	2(10%) (0.0279-0.301)	14(14%) (0.0853-0.2214)
Triplet (95%CI)	1(2.5%) (0.0044-0.1288)	0(0) 00	1(2.5%) (0.0044-0.1288)	2(10%) (0.0279-0.301)	4(4%) (0.0157-0.0984)
Total (95% CI)	29(72.5%) (0.5717-0.8389)	14 (70%) (0.481-0.8545)	18(90%) (0.699-0.9721)	16(80%) (0.584-0.9193)	

Table 3. Prevalence of parasitic nematodes according to different farms

Species of Parasite identified	Farm A 20	Farm B 20	Farm C 20	Farm D 20	Farm E 20	Total Prevalence (%)
Ascaris lumbricoides (95%CI)	4(20%) (0.0807-0.416)	5(25%) (0.1119-0.4687)	1(5%) (0.0089-0.2361)	5(2%) (0.1119-0.4687)	8(40%) (0.2188-0.6134)	23(23%) (0.1584-0.3215)
Fasciolopsis buski (95%CI)	1(5%) (0.0089-0.2361)	1(5%) (0.0089-0.2361)	4(20%) (0.0807-0.416)	3(15%) (0.0524-0.3604)	2(10%) (0.0279-0.301)	11(11%) (0.0625-0.1863)
Paragonimus westermanii (95%CI)	1(5%) (0.0089-0.2361)	3(15%) (0.0524-0.3604)	7(35%) (0.1812- 0.5671)	6(30%) (0.1455-0.519)	2(10%) (0.0279-0.301)	19(19%) (0.1251-0.2778)
Stephanurus dentatus (95%CI)	1(5%) (0.0089-0.2361)	1(5%) (0.0089-0.2361)	1(5%) (0.0089-0.2361)	6(30%) (0.1455-0.519)	3(15%) (0.0524-0.3604)	12(12%) (0.07-0.1981)
Metastrongylus apri (95%CI)	1(5%) (0.0089-0.2361)	3(15%) (0.0524-0.3604)	2(10%) (0.0279-0.301)	1(5%) (0.0089-0.2361)	1(5%) (0.0089-0.2361)	8(8%) (0.0411-0.15)
Bourgelatia didacta (95%CI)	5(2%) (0.1119-0.4687)	2(10%) (0.0279-0.301)	3(15%) (0.0524-0.3604)	1(5%) (0.0089-0.2361)	3(15%) (0.0524-0.3604)	14(14%) (0.0853-0.2214)
Oesophagostomum dentatum (95%CI)	1(5%) (0.0089-0.2361)	1(5%) (0.0089-0.2361)	2(10%) (0.0279-0.301)	1(5%) (0.0089-0.2361)	00 00	5(5%) (0.0215-0.1118)
Macracanthorhyncus hirudinaceus (95%CI)	00	00	3(15%) (0.0524- 0.3604)	00	00	3(3%) (0.01-0.0845)
Necator Spp (95%CI)	1(5%) (0.0089-0.2361)	00	00	00	1(5%) (0.0089-0.2361)	2(2%) (0.0055-0.07)

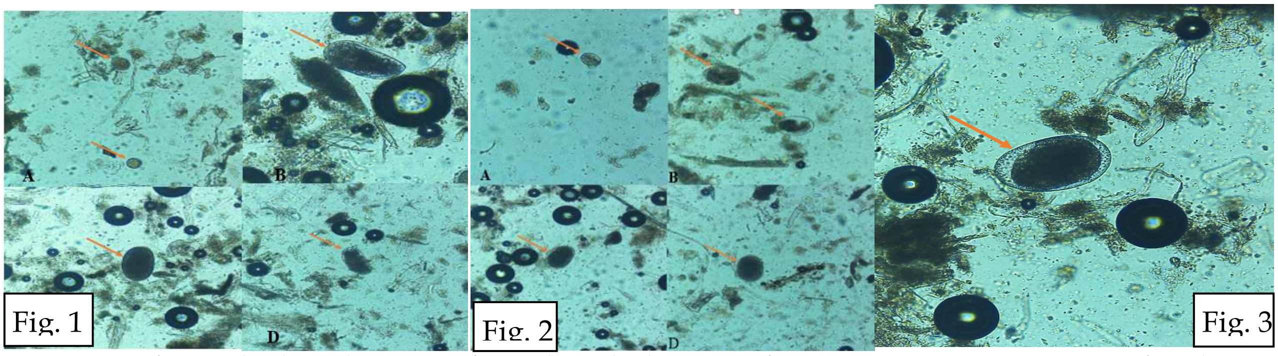

Fig. 1. **A**. Egg of Ascarislumbricoides, **B.** Egg of Fasciolopsis buski, **C.** Egg of Paragonimus westermanii, **D**. Egg of Stephanurus dentatus viewed at X 100 Magnification lens. Fig. 2. **A.** Egg of Metastrongylus apri, **B**. Egg of Bourgelatia didacta, **C**. Egg of Oesophagostomum dentatum, **D.** Egg of Macrocantorhynchus hirudinaceus viewed at X 100 Magnification lens. Fig. 3 **A**. Egg of Necator spp viewed at X 100 Magnification lens.

It has been established that prevalence of parasites was mostly influenced by the type of husbandry system been practiced (Wabacha et al., 2001; Jatfa et al., 2018). The overall prevalence in the study was 0.77 (77%) which was higher than findings of Sowemimo et al. (2012), Jatfa et al. (2019), Okorafor et al. (2014), Karaye et al. (2016), Obisike et al. (2018), Akanni et al. (2017), Lekko et al. (2018) and Wosu (2015) who reported prevalent rates of 35.8%, 53.7%, 32.7%, 61.5%, 50%, 31%, 5.8% and 24.1% respectively. However, the prevalence was lower compared to Nwoha and Ekwurike (2011) who reported 100%. In other countries, reported prevalence was 25% documented in Ethiopia by Jufare et al. (2015) and 28% reported in Ghana by Atawalna et al. (2016) and 61.4% documented by Roesel et al. (2017) in Uganda. In present study adults and neonates were more at risk, having a prevalence of 90% and 85% respectively when compared to weaners and growers. This differs with studies of (Abonyi et al., 2020) who reported that Youngers were more at risk than adults. This may have immunological undertone. In young animals immune system was not fully developed as result they were more susceptible to parasitic infections. Prevalence based on breed showed that Hampshire Breed recorded high prevalence of 18 (90%) and Duroc breed as lowest with 14 (70%). It was showed that Hampshire Breed was more susceptible to infection than other breeds. Although other studies reported that exotic breeds were more susceptible than local breeds as reported by Yaji et al. (2019) and Olaniyi (2014).

The study revealed that *Ascaris lumbricoides* 23(23%), was the dominant parasite and was consistent with the findings of 16.5 %, 24.17 %, from Nasarawa and Benue state (Karaye et al., 2016; Yaji et al., 2019) but differs with (Akanni et al. (2017; Dogo et al., 2017; Abonyi et al., 2020) who reported 12.5%, 4.4% and 0.7% from Plateau and Enugu State. *Ascaris* has zoonotic potential which was significant from public health point of view. *Ascaris* infections in humans are acquired through consumption of contaminated food and water by faeces of pigs containing eggs of the parasites (Onunkwo et al. 2018). The use of pig manure in vegetable farming and consumption of pork meat has tendency of spreading the infection in the study area (Nwanta et al., 2011),

Other parasites of importance isolated are *Bourgelatia didacta* 14(14%), *Paragonimus westermanii* 13(13%), *Stephanurus dentatus* 12(12%), *Fasciolopsis buski* 11(11%), *Metastrongylus apri* 8(8%), *Oesophagostomum dentatum* 5(5%), *Parastrongylus rubidus* 2(2%), *Macracanthorhyncus hirudinaceus* 2(2%), *NecatorSpp* 2(2%). Some authors reported higher prevalence for *Oesophagostomum oocyst* 7.5 % ,Karaye et al., 2016, *Oesophagustomum* Spp (11%) (Akanni et al.(2017), *Fasciolopsis* 16.4% Yaji et al., 2019. *Oesophagostomum dentatum* 20.8%, *Necator Spp* 10.2% (Dogo et al., 2017) while lower prevalence for *Paragonimus westermanii* 12.4% ,*Metastrongylus apri* 2.2 %, *Stephanurus dentatus* 4.9%, Dogo et al., 2017 when compared with this study. The difference in the findings of these study with others could be attributed to disparity epidemiological and climatic factors capable of influencing gastrointestinal infections such as husbandry systems, breed, season, nutritional status, availability of veterinary services, interpretation of results/observation and number of samples examine. Moreover, some of the findings emanated from abattoir surveys which are naturally biased, because most sick or unproductive animals culled from the farms are salvaged at the abattoirs; hence higher chances of pathogen recovery from abattoir-based than farm-based studies (Obonyo et al., 2013; Abonyi et al., 2020).

Conclusion

High prevalence of gastrointestinal parasites infection on different farms within Jos Metropolis shows that the infection has continued to rise unabatedly. Poor management practices and climatic factors may have favoured the endemicity and proliferation of the parasites resulting in high prevalence of gastrointestinal parasites. This calls for drastic preventive and control measures gastrointestinal parasites to boost pig production and reduce public health consequences.

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