

*Full Length Research Paper*

# Epidemiological survey of gastrointestinal parasites of pigs in Ibadan, Southwest Nigeria

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**A cross-sectional study was undertaken to determine the prevalence and intensity of gastrointestinal parasites in pigs from the Teaching and Research Farm of the University of Ibadan, Ibadan, Oyo State, Nigeria. Faecal samples were collected randomly from 271 pigs between April and October 2010, processed by modified Kato-katz technique and then examined for the presence of helminth ova and protozoan oocysts and cysts. Out of the 271 faecal samples examined, 97 (35.8%) were infected with one or more parasite species. Five types of parasites were identified, including *Trichuris suis*, *Ascaris suum*, human hookworm, *Stephanurus dentatus* and *Isoospora suis*. *T. suis* was the most prevalent parasite. The prevalence of intestinal parasites was significantly higher in male pigs than in females ( $P < 0.05$ ). Single infection was more common with a prevalence of 80.4%. The results of this study provide baseline information about the parasitic fauna in intensively managed pigs in Ibadan, Oyo State, Nigeria.**

**Key words:** Prevalence, gastrointestinal parasites, *Ascaris suum*, pig, *Trichuris suis*, Ibadan.

## INTRODUCTION

In swine industry, the sustainable development of this sector is faced with a number of constraints, prominent among which is the disease is caused by intestinal parasites. Gastrointestinal parasites are responsible for substantial loss of productivity in swine and other livestock industry. They constitute a major impediment to efficient and profitable livestock production (Boes et al., 2000; Joachim et al., 2001). Gastrointestinal parasitism in swine affects swine's performance in terms of efficient feed conversion, poor growth rate, reduced weight gain and the condemnation of affected organs after slaughter (Nsoso et al., 2000).

In Nigeria, livestock production sector is vital not only because of its economical benefits but because over 80% of the population are involved in one way or the other in Agriculture (Otuma and Udenwa, 2009). Several studies on gastrointestinal parasites affecting pigs have been undertaken in Nigeria and other parts of the world. In a study investigated among 450 pigs for helminth infections

from Jos Plateau, Nigeria, Fabiyi (1979) reported a total of 15 species of helminths which include *Hyostrongylus rubidus*, *Ascarops strongylina*, *Physocephalus sexalatus*, *Ascaris suum*, *Globocephalus urosubulatus*, *Strongyloides ransomi*, *Trichuris suis*, *Oesophagostomum quadrispinulatum*, *Oesophagostomum dentatum*, *Metastrongylus salini*, *Stephanurus dentatus*, *Cysticercus cellulosae*, *Cysticercus tenuicollis*, hydatid cyst of *Echinococcus granulosus* and *Spirometra erinacei*. In a study conducted among 383 pigs for parasitic infection in Eastern Centre Province, Burkina Faso, Tamboura et al. (2006) reported that 91% of the pigs were infected with one or more parasites and *Ascaris suum* was the most prevalent parasite (prevalence of 40%). Parasites of pigs and their potential to infect humans have recently become major issues among the public because of reported outbreaks of water-borne parasitic diseases such as *Giardia lamblia* and *Cryptosporidium* spp. (Olso and Guselle, 2000).

Although studies have been conducted on the intestinal helminth of pigs in some parts of Nigeria, however there is little information regarding the parasitic fauna of pigs in Ibadan. Hence, this study was undertaken to provide epidemiological data on the prevalence and intensity of

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**Table 1.** Prevalence (%), intensity (I) and range (R) of gastrointestinal parasite eggs in the faeces of 271 pigs in Ibadan.

Parasite	Number infected	(%)	I (Mean ± S.E.)	Range
<i>Trichuris suis</i>	33	12.2	12.03 ± 3.25	0 - 680
<i>Ascaris suum</i>	30	11.1	5.31 ± 1.10	0 - 140
Human hookworm	16	5.9	1.92 ± 0.51	0 - 60
<i>Stephanurus dentatus</i>	3	1.1	0.22 ± 0.13	0 - 20
<i>Isospora suis</i>	17	6.3	-	-

gastrointestinal parasites of pigs in the Teaching and Research Farm of the University of Ibadan, Ibadan.

## MATERIALS AND METHODS

### Study area

Ibadan is the largest indigenous city in tropical Africa and lies within longitude 007°2' and 007°40'E and latitude 03°35' and 4°10'N. Ibadan is 128km Northeast of Lagos and 345 km Southwest of Abuja, the Federal Capital (Udo, 1994). The population of Ibadan is estimated to be about 3.8 million according to 2006 estimates. The study area has been described in full details earlier (Sowemimo, 2007). The University of Ibadan Teaching and Research farm is located in the Faculty of Agriculture. The swine unit consists of breeding, farrowing, finishing and experimental pens. The unit is stocked with different breeds of pigs comprising of pure Duroc, strains of large white, Hampshire and local breeds. The total number of pigs in the swine unit at the time of sampling which took place between April and October 2010 was 483 pigs. The parent stocks were sourced from reputable pig commercial farms operating an intensive production system and International Institute for Tropical Agriculture (IITA) in Ibadan.

### Faecal samples collection

Faecal samples were randomly collected from the rectum of 271 pigs using a long forceps into a clean 30 ml sterile bottles labeled with the approximate age of pig, sex and location of collection. The faecal sampling took place between April and October 2010. The faecal samples collected were then transported to the Parasitology Laboratory of the Department of Zoology, Obafemi Awolowo University, Ile-Ife, where they were preserved with 10% formalin before processing.

### Laboratory procedure

The preserved faecal samples were later processed for egg concentration using modified Kato-Katz technique as described by Forrester and Scott (1990) and later examined under light microscope at X100 magnification for the presence of helminth ova and protozoan cysts/oocysts. The parasite eggs were identified based on structural and morphometric criteria (Soulsby, 1982). The number of eggs was multiplied by 20 to convert the values obtained to eggs per gram (epg) of faeces.

### Statistical analysis

SPSS version 16.0 (SPSS Inc. Chicago Illinois, USA) was used for

statistical analysis. The differences in prevalence (calculated by dividing the number of infected pigs with the total number of pigs in that category and expressed as a percentage) of parasite infections between age group and sex were tested by chi-squared ( $\chi^2$ ) tests. A Mann-Whitney U test (non-parametric test) was used to test the difference in intensity (number of eggs in one gram of faeces) between sexes.

## RESULTS

### General infection patterns

Out of the 271 pigs examined for intestinal parasitic infections, 97 were infected with one or more parasite species, giving an overall prevalence of 35.8%. Five types of gastrointestinal parasites were identified, comprising four nematodes and one protozoan. These included *T. suis* having a prevalence of 12.2%, followed by *A. suum* with a prevalence of 11.1%, while human hookworm had a prevalence of 5.9%. Others are *S. dentatus* with the lowest prevalence of 1.1% and *I. suis* the only protozoan with a prevalence of 6.3%. The overall mean intensities (epg) for the various parasite species were 12.03 ± 3.25 for *T. suis*, 5.31 ± 1.10 for *A. suum*, 1.92 ± 0.51 for hookworm and 0.22 ± 0.13 for *S. dentatus* (Table 1). The prevalence of gastrointestinal parasites in pigs age 0 - 6 months was slightly higher than in other age groups, although there was no significant difference ( $P > 0.05$ ). Moreover, the prevalence of intestinal parasites was significantly higher in male pigs (45.0%) than in females (30.4%) ( $\chi^2 = 5.845$ ,  $df = 1$   $P < 0.05$ ) (Table 2).

### Prevalence and intensity of intestinal parasites in relation to age of pig

As can be seen in Table 3, the prevalence of infection was slightly higher in pigs older than 12 months (adult pigs) than in pigs less than 6 months old and those of age 7 - 12 months (young pigs) with regard to infection with *T. suis* and hookworm. However, the prevalence of *Ascaris* infection decreased from 12.6% in pigs less than 6 months old to 7.1% in pigs older than 12 months. *S. dentatus* infection was recorded only in young pigs (less than 6 months), while the only protozoan observed (*I. suis* infection) occurred in pigs less than 12 months old.

**Table 2.** Prevalence (%) of gastrointestinal parasites of pigs in relation to age and sex.

Variable	Number examined	Number infected	(%)
<b>Age (months)</b>			
0 - 6	183	68	37.2
7 - 12	74	24	32.4
> 12	14	5	35.7
<b>Sex</b>			
Male	100	45	45.0
Female	171	52	30.4
Total	271	97	35.8

$\chi^2 = 5.845$ ;  $df = 1$ ,  $P < 0.05$ .

**Table 3.** Prevalence (%) and intensity (I) of gastrointestinal parasites in relation to age of pig.

Parasite	0 - 6 months		7 - 12 months		>12 months	
	%	I (Mean $\pm$ SE)	%	I (Mean $\pm$ SE)	%	I (Mean $\pm$ SE)
<i>Trichuris suis</i>	12.6	10.49 $\pm$ 2.67	10.8	17.03 $\pm$ 9.91	14.3	5.71 $\pm$ 3.88
<i>Ascaris suum</i>	12.6	5.14 $\pm$ 1.22	8.1	5.94 $\pm$ 2.46	7.1	4.29 $\pm$ 3.09
Human hookworm	6.0	1.53 $\pm$ 0.55	5.4	2.70 $\pm$ 1.18	7.1	2.86 $\pm$ 2.86
<i>Stephanurus dentatus</i>	1.6	0.33 $\pm$ 0.19	-	-	-	-
<i>Isospora suis</i>	6.6	-	6.8	-	-	-

Pigs aged 7 - 12 months were slightly more infected with *T. suis* than other age groups, while the intensities of infection (epg values) were similar and comparable in all age groups with regard to *A. suum* infection. Similar trend was also observed in the pattern of intensity with regard to hookworm infection where epg values were similar.

#### Prevalence and intensity of intestinal parasites in relation to sex of pig

The prevalence of *A. suum* infection was significantly higher in male pigs (18.0%) than in females (7.0%) ( $\chi^2 = 7.731$ ,  $df = 1$ ;  $P < 0.05$ ). Although, the prevalences and intensities of infection with regards to *T. suis* and hookworm were higher in male pigs than in females, there were no significant differences. There was no infection in males pigs with regard to *S. dentatus*. The intensity of *Ascaris* infection was significantly higher in males than in female pigs ( $U = 7708$ ,  $df = 1$ ,  $P < 0.05$ ) (Table 4).

#### Mixed infections

Out of 97(35.8%) pigs infected with one or more parasite species, 78 (80.4%) pigs had single infection with either *A. suum* or *T. suis* or hookworm or *S. dentatus* or *I. suis*. 17 (17.5%) had double infection comprising *Ascaris* and *Trichuris*, *Trichuris* and *Isospora*, hookworm and *Isospora*, *Ascaris* and hookworm, *Ascaris* and *Isospora*,

while 2 (2.1%) had triple infection comprising of *Ascaris*, hookworm and *Trichuris* (Table 5).

#### DISCUSSION

This study revealed that the overall prevalence of gastrointestinal parasites recorded among 271 pigs from the Teaching and Research Farm in Ibadan was 38.8%. The prevalence was significantly lower than 100% reported from Umuahia, Abia State, Nigeria (Nwoha and Ekwurike, 2011) and 91% from Burkina Faso (Tamboura et al., 2006). The lower prevalence of intestinal parasites recorded in this study could be as a result of effective management practices in the farm, such as daily cleaning and disinfectants of pens, giving high quality commercial feed and the use of effective antihelminthic drugs at the right time. Results from previous studies have shown that the prevalence of gastrointestinal parasites in intensive pig farm is usually considerably lower (Liu and Lu, 2002). In this study five types of intestinal parasites were identified as compared to 15 species of helminths reported from 450 pigs in Jos, Plateau, Nigeria (Fabiya, 1979). Out of the seven nematode species listed as helminths of veterinary importance by Nansen and Roepstorff (1999), three were observed in this study and they include *A. suum*, *T. suis* and *S. dentatus*.

This study also revealed that *T. suis* was the most prevalent parasite followed by *A. suum*. This is in contrast with the findings of past studies where *A. suum* was

**Table 4.** Prevalence (%) and intensity (I) of gastrointestinal parasites in relation to sex of pig.

Parasites	Male		Female		Both Sexes	
	%	I (Mean ±SE)	%	I (Mean ± SE)	%	I (Mean ± SE)
<i>Trichuris suis</i>	13.0	13.80 ± 4.51	11.7	10.99 ± 4.43	12.2	12.03 ± 3.25
<i>Ascaris suum</i>	18.0	7.80 ± 1.99	7.0	3.86 ± 1.29	11.1	5.31 ± 1.10
Human hookworm	8.0	2.00 ± 0.78	4.7	1.87 ± 0.67	5.9	1.92 ± 0.51
<i>Stephanurus dentatus</i>	-	-	1.8	0.35 ± 0.20	1.1	0.22 ± 0.13
<i>Isospora suis</i>	5.0	-	7.0	-	6.3	-

**Table 5.** Occurrence of multiple infections of intestinal parasites in 271 pigs in Ibadan.

Parasite	Frequency	(%)
<i>Ascaris</i> only	19	19.6
Hookworm only	8	8.2
<i>Stephanurus dentatus</i> only	2	2.1
<i>Trichuris suis</i> only	22	22.7
<i>Isospora suis</i> only	27	27.8
<i>Ascaris</i> + <i>Trichuris</i>	4	4.1
<i>Trichuris</i> + <i>Isospora</i>	4	4.1
Hookworm + <i>Isospora</i>	5	5.2
<i>Ascaris</i> + <i>Isospora</i>	2	2.1
<i>Stephanurus</i> + <i>Isospora</i>	1	1.0
<i>Ascaris</i> + hookworm	1	1.0
<i>Ascaris</i> + hookworm + <i>Trichuris</i>	2	2.1

reported as the most prevalent parasite in scavenging pigs (Kumar et al., 2002; Ngowi et al., 2004; Tamboura et al., 2006) and also in semi-intensively managed pigs (Nsoso et al., 2000). The moderately high prevalence of *T. suis* (12.2%) could be due to the ability of the eggs to survive for long in the environment (Roepstorff and Murrell, 1997; Pittman et al., 2010). However, the prevalence of 11.1% recorded for *A. suum* in this study was lower than 12.7% reported from Eastern Ghana (Tiwari et al., 2009), 54.6% from Bostwana (Nsoso et al., 2000) but higher than 5.2% from China (Weng et al., 2005). The prevalence of *A. suum* recorded in this study was not extremely high; however infection could have arisen probably as a result of ineffective anthelmintics administered at the source farm prior to transportation to the Teaching and Research farm, which can consequently lead to the contamination of the farm. Hence, there is the need to create the awareness as to the possible health risk following human infection with this parasite. It has been reported that *A. suum* is among the causes of visceral larva migrans in humans (Sakakibara et al., 2002). In addition, human cases with liver and lung lesions as well as cases and epidemics of eosinophilia pneumonia have been reported and *A. suum* specific antibodies were positive in all the cases (Arimura et al., 2001; Kakihara et al., 2004).

Previous studies by Esrony et al. (1997), Nsoso et al.

(2000) and Kumar et al. (2002) observed the effect of sex and age of pigs on the prevalence of helminth parasites. Their findings are in agreement with the results of this study, indicating that parasites have a wide occurrence spectrum. In this study, the prevalence of intestinal parasites was significantly higher among male pigs than in females, which is in contrast with the findings of Tamboura et al. (2006) where female pigs have higher prevalence than the males. Furthermore, human hookworm (which could either be *Necator americanus* or *Ancylostoma duodenale* as their eggs are indistin-guishable) is another parasite identified in this study having a prevalence of 5.9%. A higher prevalence (33%) was reported for hookworm (*Necator* sp.) in a recent study investigated among 300 intensively managed pigs from Umuahia, Abia State, Nigeria (Nwoha and Ekwurike, 2011). Previous study has shown that there is the possibility of pigs acting as transport host for human parasites (Steenhard et al., 2000). The presence of hookworm in the pigs poses health risk for humans especially farm workers.

*S. dentatus* is a kidney worm of pig and one of the intestinal parasites of pigs identified in this study, having the lowest prevalence of 1.1%. Infection of pigs with this parasite may occur either by ingestion of infective larvae, by skin penetration or by ingestion of infected earthworms (Soulsby, 1965). *I. suis* is the only protozoan observed in this study with a prevalence of 6.3% lower

than 26.4% reported from Ontario, Canada (Aliaga-Leyton et al., 2011) and 27.8% from Poland (Karamon et al., 2007). *T. suis* infection is commonly found among piglets (young pigs) as reported by previous investigators and most common cause of diarrhoea in young pigs.

In conclusion, the result of this study has revealed that pig faeces could be an important source for some parasites capable of infecting humans. In a community setting where pigs are reared and pig meat is consumed by a large part of the population, they could be involved in zoonotic helminthosis and a further investigation should study the possible impact of parasitic infections of pigs on public health in Nigeria.

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