A CROSS SECTIONAL SURVEY OF GASTROINTESTINAL HELMINTHS IN CONFINED PIGS IN OGBOMOSO, SOUTH-WEST NIGERIA

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ABSTRACT

A cross sectional study was conducted to investigate the prevalence and intensity of gastrointestinal helminths in confined pigs in Ogbomoso, South-west Nigeria. A total of 345 pigs (124 (35.9%) males and 221(64.1%) females) were enrolled. Faecal samples were examined with floatation and sedimentation techniques and McMaster-counting chamber was used for egg count/gram. Our result revealed that 159 (46.0) of the examined pigs were infected with at least one helminth species of *Ascarops strongylina* (57.4%), *Physocepahlus sexalatus* (32.2%), *Trichuris suis* (68.7%), *Ascaris suum* (31.3%), *Hyostrongylus rubidus* (23.5%), *Strongyloides ransomi* (53.0%) and *Taenia solium* (55.7%). The infection was statistically significant (*P*<0.001) with sex and highest prevalence was recorded among female pigs. Mean egg count for all the identified gastrointestinal helminths were age dependent except with *A. suum* and *S. ransomi* (1742.21 ± 185.15; 95%CI 1374 – 2109.83; *P*<0.001). Infection in adults and growers were not comparable (36.2%) but comparable with piglets (27.5%) at *P*<0.001. Pigs raised in cemented floor recorded low prevalence (45.2%) compared to uncemented floor (54.8%), (*P*<0.001). Pigs housed on plain floor showed striking increase in parasite egg intensities when compared to pigs' house on cemented floors. There is a risk of zoonotic infections. Stakeholders can mitigate morbidity and transmission by regular visits, awareness and drug interventions.

Key words: confined pigs, helminths, Nigeria, Ogbomoso

INTRODUCTION

Commercial and subsistence swine production in Nigeria is fast becoming a charitable venture. It increases provision of animal protein for human consumption, employment generation, poverty reduction, contribution to the National Gross Domestic Product and general economic growth (Pam *et al*., 2013; Bamiro *et al*., 2015). Recently, substantial loss of productivity is recorded annually in swine husbandry worldwide due to

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bewildering numbers of gastrointestinal helminth infections (Boes *et al*., 2000; Joachim *et al*., 2001; Nissen *et al*., 2011). The infections often present the pig host with retarded growth, delayed fertility and productivity, high morbidity and mortality (Nissen *et al*., 2011). Infected pigs rarely show ominous clinical symptoms, therefore, treatment is often delayed (Mutual, 2007; Aliaga-Leyton *et al*., 2011; Olaniyi, 2014). In tropical and subtropical zones, rate of parasitic infections in pigs is usually high as a result of favourable climatic conditions that influence their transmission in most endemic settings (Radostits *et al*., 2007; Dagnachew *et al*., 2011; Obonyo *et al*., 2013).

Feeding habit of these ungulates such as scavenging, cannibalism and rearing system adopted are major decimating factors of infection (Pam *et al*., 2013). Confined pigs, despite intensive management pick up parasitic infections easily but severity is minimal when compared to free range animals (Nsoso *et al*., 2000; Shittu *et al*., 2018). Although, in recent studies, a marked decline in prevalence, intensity and worm load of helminths in domestic pigs have been documented, the reasons adduced for this development might be due to the gradual change from traditional to modern intensive production systems (Nansen and Roepstorff, 1999; Järvis and Mägi, 2008; Tiwari *et al*., 2009; Nwoha and Ekwurike, 2011; Barbosa *et al*., 2015; Nonga and Paulo, 2015). However, some helminths are apparently influenced by management changes due to differences in the basic biological requirements of the pre-infective developmental stages, differences in transmission characteristics and immunogenicity of the different worm species (Nansen and Roepstorff, 1999; Hewitson and Maizels, 2014). Several reports have identified gastrointestinal helminths in pigs in other geopolitical zones of Nigeria (Nwoha and Ekwurike, 2011; Sowemimo *et al*., 2012; Pam *et al*., 2013; Aiyedun, 2014; Olaniyi, 2014), but there is paucity of data regarding the intestinal parasitic fauna of confined pigs in Ogbomoso, South-west, Nigeria. Hence, this study was undertaken to provide some baseline epidemiological data upon which control intervention can be based in the study area and other areas with similar risk factors.

MATERIALS AND METHODS

The study was conducted in five pig farms strategically located in the five local government areas (LGA) of Ogbomoso, South-west, Nigeria, viz: Ogbomoso North and South, Surulere, Orire and Ogo-oluwa LGAs. Ogbomoso is the second largest town in Oyo State with an urban population of about 334,000 (NPC. 2007) and lies on coordinates of latitude 80° 07′ North of the equator and 40° 30′ East of the Greenwich Meridian at an elevation of 347 m (1,138 ft). It has an area landmass covering about 37,984 square Kilometres and lies within the derived tropical savannah region. Ogbomoso is the gateway to northern Nigeria, it is 57km south-west of Ilorin and 53km north-east of Osogbo. Inhabitants are mostly Yoruba, with few migrants from Hausa and Ibo ethnic groups. It is an agrarian community with plantations of yam, cassava, maize, tobacco and other cash crops (Chernow and George, 1993). The farms selected for this study were commercial smallholder pens. As at the time of sampling for this study, twenty five commercial farms were identified in the study area. Only the farms that meet up with our study protocols were included i.e. piggeries that had enclosures with both bare and cemented floors respectively.

A simple random sampling technique was employed in the selection of one piggery from each of the five LGAs that make up Ogbomoso environs. Only piggeries that were managed in enclosed fences were recruited for the study. Prior to sample collections, information regarding breed, age, sex and last administration of anthelminth drugs were obtained with a well-structured pre-tested questionnaire from the farmers. The pig species were further ascertained following the morphological identification parameters as stated in FAO (Shannon *et al*., 2001; FAO, 2011).

The farms were visited three times in a week in the early hours of the day (8:00am - 11:00am) for a period of six months. Faecal samples were collected directly from the rectum of the pigs using a long forceps into clean sterilized 30 ml screw cap bottles labelled accordingly. The 10% formosaline preserved samples cooled in ice water thermos flask were immediately transported to the Parasitology Laboratory of the Department of Zoology, University of Ilorin where laboratory examination was conducted. Examination and identification of helminth eggs were carried out by floatation techniques as described by Soulsby (1982), Nansen and Roepstorff (1999) and Cheesbrough (2005). Presence of parasites (helminth eggs) was examined using a x10 eyepiece and a x4 objective (40× total magnification) on a light microscope. Helminth eggs were identified by the use of standard identification keys based on their morphological features as described by Soulsby (1982) amd Radostits *et al*. (2007). The intensity of the parasites were done using McMaster counting chamber. The guideline to interpretation of egg per gram was classified according to Hansen and Perry (1990) and Nonga and Paulo (2015) with slight modifications. Helminth count of <100 epg was grouped as low levels of infection while >300 epg was grouped as significant high levels.

The study protocols were approved by the University of Ilorin Ethical Review Committee. The respective owners of the sampled piggeries were contacted and enlightened concerning the protocols. The farmers consent was requested and an approval was given before commencement of the study.

All raw data obtained from this study was analyzed with SPSS version 16.0 (SPSS Inc. Chicago Illinois, USA). The differences in prevalence of parasitic helminths with respect to floor type, breed, growth stage and sex were tested by chi-square ($\chi 2$). A Mann-Whitney U test (non-parametric test) was used to test the differences in intensity (number of eggs in one gram of faeces) between floor type, breed, growth stage and sexes.

RESULTS AND DISCUSSION

A total of 345 pigs of different breeds (35.9% male and 64.1% female) were examined. The detailed characteristic of pigs investigated in this study is represented in Table 1. The overall prevalence was 159(46.0%). The seven different helminth species identified are *T. suis* 237(68.7 %.), followed by *A. strongylina* 198(57.4%), *T. solium* 192(55.7%) and *S. ransomi* 183(53.0%). Highest and lowest mean egg intensity recorded by *A. strongylina* 2102.84 ± 147.93 (95% CI 1811.87 – 2393.81) and *H. rubidus* (126.17 ± 12.93) at 95% CI (100.57 – 151.43) respectively. Mean egg parasite counts were all statistically significant at $P<0.001$ (Table 2). Comparison of overall prevalence with respect to pen floor revealed a statistically significant ($P<0.005$) higher occurrence and intensity of all the identified helminth species among the pigs reared in plain ground pen floors as illustrated in Table 3 and Figure1. Stratification of infection with respect to sex showed that female pigs were significantly more infected than males ($P<0.05$) as shown in Table 4. However, infections with *T. suis*, *S. ransomi* and *T. solium* were statistically insignificant ($P>0.05$).

Table 1. Population characteristics of pigs used in the study.

	Breeds N (%)						
Floor Type	Local	Yorkshire	Duroc	Hampshire	Danish Landrace	Berkshire	Total No.
Cemented	24(22.9)	30(68.4)	39(68.4)	24(29.6)	15(71.4)	24(47.1)	156 (45.2)
Bare-ground	81(77.1)	0(0)	18(31)	57(70.4)	6(28.6)	27(52.9)	189(54.8)
Sex							
Male	21(16.2)	10(8.1)	30(23.1)	27(21.8)	15(12.1)	21(16.9)	124(35.9)
Female	84(38.0)	20(9.0)	27(12.2)	54(24.4)	6(2.7)	30(13.6)	221(64.1)
Total	105(30.4)	30(8.7)	57(16.5)	81(23.5)	21(6.1)	51(14.8)	345(100)

Table 2. Overall Prevalence and Intensity of gastrointestinal helminths in confined pigs.

Helminth Parasites	Prevalence	Intensity			*P*-value
			95% CI		
	No. Infected (%)	Mean ± S.E.M	Lower Bound	Upper Bound	
A. strongylina	198(57.4)	2102.84 ± 147.93	1811.87	2393.81	<0.001
P. sexalatus	111(32.2)	885.67 ± 76.64	734.92	1036.42	<0.001
T. suis	237(68.7)	821.92 ± 51.92	719.81	924.04	<0.001
A. suum	108(31.3)	810.62 ± 71.54	669.92	951.32	<0.001
H. rubidus	81(23.5)	126.17 ± 12.93	100.57	151.43	<0.001
S. ransomi	183(53.0)	1616.09 ± 90.85	1437.40	1794.78	<0.001
T. solium	192(55.7)	1653.06 ± 108.23	1440.18	1865.94	<0.001

Table 3. Intensity of gastrointestinal helminths epg with respect to pen floor type.

Helminths Species/ Pen Floor Type	Mean±SEM	95% Confidence Interval (CI)		*P*-value
		Lower Bound	Upper Bound	
A. strongylina				<0.001
Cemented	523.08 ± 70.85	383.13	663.02	
Plain floor	3406.78 ± 222.90	2967.09	3846.46	
P. sexalatus				<0.001
Cemented	208.13 ± 51.26	106.88	309.38	
Plain floor	1444.90 ± 118.97	1210.22	1679.59	
T. suis				<0.001
Cemented	203.13 ± 20.64	162.37	243.90	
Plain floor	1332.67 ± 75.13	1184.46	1480.87	
A. suum				0.007
Cemented	598.56 ± 91.47	417.87	779.25	
Plain floor	985.65 ± 105.06	778.40	1192.90	
H. rubidus				<0.001
Cemented	32.12 ± 11.44	9.51	54.72	
Plain floor	203.49 ± 19.97	164.10	242.88	
S. ransomi				0.057[ns]
Cemented	1426.15 ± 140.51	1148.58	1703.72	
Plain floor	1772.87 ± 117.65	1540.78	2004.96	
T. solium				<0.001
Cemented	267.57 ± 66.88	135.46	399.69	
Plain floor	2796.64 ± 143.88	2512.82	3080.46	

[ns]Not Significant

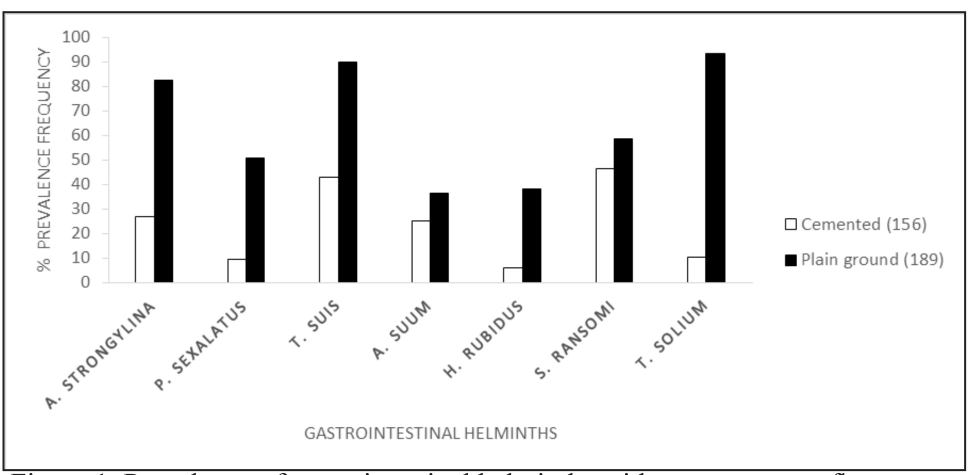

Figure 1. Prevalence of gastrointestinal helminths with respect to pen floor type.

Table 4. Prevalence of gastrointestinal helminths with respect to sex and growth stage.

Variables	Helminth Parasites N (%)						
	A. strongylina	*P. sexalatus*	*T. suis*	*A. suum*	*H. rubidus*	*S. ransomi*	*T. solium*
Sex (N)							
Male (124)	57(46)	21(16.9)	84(67.7)	51(41.1)	21(16.9)	72(58.1)	69(55.6)
Female (221)	141(63.8)	90(40.7)	153(69.2)	57(25.8)	60(27.1)	111(50.2)	123(55.7)
P-value	0.001	<0.001	0.775[ns]	0.003	0.032	0.162[ns]	0.998[ns]
Growth stage (N)							
Piglet (95)	49(51.6)	6(6.3)	6(6.3)	30(31.6)	3(3.2)	57(60.0)	15(15.8)
Grower (125)	61(48.8)	29(23.2)	122(97.6)	77(61.6)	6(4.8)	83(66.4)	62(49.6)
Adult (125)	88(70.4)	76(60.8)	109(87.2)	1(0.8)	72(57.6)	43(34.4)	115(92.0)
P-value	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

[ns]Not Significant

The prevalence of helminths with respect to growth stage identified that adult pigs (sows and boars) recorded highest gastrointestinal helminth parasites when compared with piglets and growers (Table 4). Mean egg count for all the identified gastrointestinal helminth parasites were all age dependent except with *A. suum* and *S. ransomi* (1742.21 ± 185.15; 95%CI 1374 – 2109.83; *P*<0.001) (Figure 2). On average, helminth infections were more apparent in the adult pigs. Growers also maintained infections at high mean egg counts ranging from (30.0 – 2176.58) as represented in Figure 2. Generally, local breeds were observed to have high prevalence and intensity of the gastrointestinal helminth infections.

The present study underscores gastrointestinal parasitic infection as a major threat in smallholder pig farming production. This is evidenced with point prevalence of 46.0% obtained in the study. Though, it is lower when compared with reports of Nwoha and Ekwurike (2011), Opara *et al*. (2006), Esther (1997) and Tamboura *et al*. (2006) in Nigeria and Burkina Faso, respectively. The lower prevalence recorded in this study may be ascribed to effective management practices such as usage of high quality commercial feed, daily cleaning, disinfectants of pens and routine usage of antihelminthic drugs adopted in the various farms visited for the study. It is also not unlikely that underestimation of infections occurred due to the precision level of the techniques used in the study.

However, of all the seven species of helminth recovered among the infected pigs, *T. suis*, *A. strongylina*, *T. solium* and *S. ransomi* were the most abundant, an observation similar with earlier reports of Opara *et al*. (2006) and Esther (1997) in Owerri and Delta respectively. This may be attributed to the ability of eggs/larvae stage of these parasites to retain its infectivity for long period of time in area where hygienic practices and management are concurrently lacking. More importantly, transmission patterns of most of these parasites are similar as previously reported by different authors (Roepstorff and Murrell, 1997; Pittman *et al*. 2010). The larvae of *P. sexalatus* and *A. strongylina* are known to be transmitted by the dung beetle an intermediate hosts (Nichols and Gomez 2014), therefore, the presence of *T. solium* in faeces of the pigs can be a function of the role of multiple transmission pattern through dung beetles. Gastrointestinal helminths of pigs have been

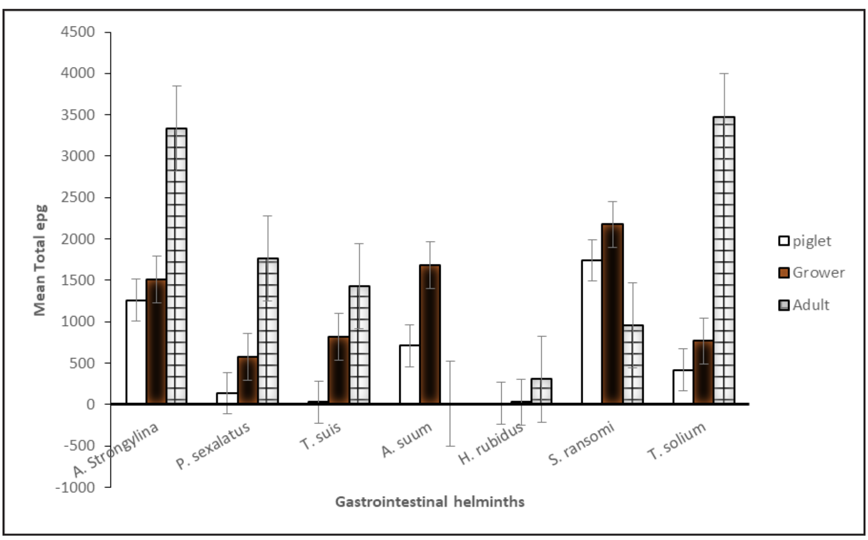

Figure 2. Intensity of gastrointestinal helminths (epg) with respect to growth stage.

widely demonstrated to manifest uneven distribution among different age groups and our report is also in tandem with earlier studies where *S. ransomi* is common with piglets; *A. suum* and *T. suis* in growers and *H. rubidus* are most prevalent in adults (Sows and Boars) (Roepstorff and Murrell 1997; Nansen and Roepstorff 1999; Tamboura *et al*. 2006). Infections with gender were comparable. Females were more infected than males, this development is in consonance with the findings of Tamboura *et al*. (2006), but in contrast with Nsoso *et al*. (2000) and Kumaresan *et al*. (2007).

This study underscores the pertinent role management practices and environmental hygiene play in the elimination of parasites, particularly helminths in pig farming production. Therefore, public enlightenment is very crucial in abating the spread of this infection.

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