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STUDY OF INTESTINAL HELMINTHS OF SWINE FROM CHIKUN AND JEMA'A LOCAL GOVERNMENT AREAS OF KADUNA STATE, NIGERIA.

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ABSTRACT
A study was conducted between May and August, 2018 to determine the prevalence of intestinal helminths of pigs in Chikun and Jema'a Local Government Areas, Kaduna State. 203 faecal samples were collected, processed and examined under light microscopy. Intestinal helminths recorded were: *Ascaris suum*(57.1%), *Oesophagostomum dentatum*(37.0%), *Hyostrongylus rubidus*(14.8%), *Metastrongylus elongates*(8.9%), *Strongyloides*(4.5%), *Stepanurus dentatum*(2.5%), *Trichuris suis*(1.5%), *Globocephalus urobuslatus*(2.0%) and *Physocephalus sexalatus*(1.5%). The overall prevalence of helminth infection in both LGAs was 71.9%. Pigs in Jema'a LGA had significantly higher prevalence (87.9%) than pigs from Chikun LGA (56.7%). Female pigs had relatively higher (74.4%) infection than male pigs (68.6%). This pattern was also reflected in Chikun LGA where female pigs had a prevalence of 63.9% compared to 46.5% in males, however, the reverse was the case in Jema'a LGA where males had 90.7% prevalence and females 85.7%. In Chikun LGA, the highest prevalence of 58.6% was recorded among pigs aged 25-36 months, followed by pigs aged 5-12 months with prevalence of 57.1%, and the least prevalence of 55.0% was recorded in pigs aged 13-24 months. The prevalence of intestinal helminthosis in pigs tends to decrease with age in Jema'a LGA. The presence of these parasites in pigs examined indicates a potential public health problem in Chikun and Jema'a Local Government Areas of Kaduna state. Enlightenment of pig farmers on the need for periodic veterinary care and restriction of stray pigs through legislation formulation and enforcement are recommended as control measures.

Keywords: Swine, Helminths, Faecal, Prevalence, Gender, Age

INTRODUCTION

Pigs are among the abundant livestock potential of Nigeria. The swine Industry has witnessed an unprecedented increase in production and consumption over the past decade; this positive development means an increase in provision of animal protein for human consumption, employment generation, poverty reduction, contributing to the nation's Gross Domestic Product and general economic growth (Anon, 1999).

Gastrointestinal parasites are among the most devastating disease causing agents of livestock, they are responsible for substantial loss of productivity in swine and other livestock industry andconstitute a major impediment to efficient and profitable livestock production (Boes *et al.,* 2000*;* Joachim *etal.*, 2001). The swine Industry in developing countries with particular reference to Nigeria is faced with a number of constraints among which are diseases, religious, cultural and environmental factors (Fabiyi, 1979; Mutual *et al., 2007).* 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). Gastrointestinal parasites mainly helminths live within the host's gastrointestinal tract, extending from the mouth through the oesophagus, stomach, small and large intestines down to the rectum; protozoan parasites also inhabit the gastrointestinal tract (Junaidu and Adamu, 1997).

Internal parasites devitalize pigs by robbing them of essential nutrients and injuring vital organs (Myer and Walker, 1999). However the diseases are often over looked because clinical symptoms are rarely apparent, losses of production occur mainly from retarded growth, delayed fertility and productivity (Mutual *et al,* 2007).

Pigs heavily parasitized are more susceptible to disease, the resulting diseases being major causes of zoonosis and economic loss. Primarily, raising pigs in pens enhances a better hygienic profile unlike when swine are raised outside pens, thus exposure of pigs outside suitable pens disposes them to the danger of parasitic infections. The most frequently reported parasites in intensive pig farming are *Ascaris sum, Trichuris suis, Ascarops strongyla, Balantidium coli* and *Cryptosporidium spp* (Caballero- Hernendez *et al*,.2004). Some of these have been able to survive in the environment. Parasites of pigs and their potential to infect humans have recently become a major issue among the public because of recent outbreaks of water-borne parasitic disease (Olson and Guselle, 2000). Water-borne transmission of intestinal parasites has been linked to domestic livestock and farming practices. The danger for humans becoming infected with protozoans of animal origin is higher than with helminths (Burton and Turner, 2003). Helminthic diseases are important but often neglected because clinical symptoms are rarely apparent, losses of production occur mainly from retarded growth and delayed fertility. They constitute a major impediment to efficient and profitable livestock production (FAO, 2000). Control of parasitic infection of swine is aimed at reducing such detrimental effects. This study therefore was channelled to investigate gastrointestinal helminthic infections among pigs in the Chikun and Jema'a local government areas of Kaduna state and determine the species prevalence.

MATERIALS AND METHODS:

Study area

A cross sectional study was conducted between May and August, 2018 to determine the prevalence of intestinal helminths in pigs in Chikun local government area, (latitude $10^0 18' 54.00^{"} N$ and longitude $7^0 16^{!} 26.40" E$) with headquarters at kujama. It has an area of 4,645km^2 and a population of 372,272 (National population commission, 2016). They are predominantly Christians. Animal husbandry is one of the most important source of revenue of the people in the study area, 80% of its active inhabitants are crop or livestock farmers. Although the breeding of ruminants is more developed, pigs are traditionally raised for commercial purposes. The pigs, mainly males, are sold alive or slaughtered in the market or outside. The vegetation of this area is of the typical guinea savannah type which according to Udu (1982) has a mean annual temperature of 29^0C and mean annual rainfall of 300mm. Pigs are raised for both commercial and subsistent purposes. While Jema'a local government area, (latitude $9^0 22' 57.68^{"}$N and longitude $8^0 16^{!} 5.27^{"} E$) with its headquarter at Kafanchan, Kaduna state. The indigenes are mainly Fantswam people, who migrated from Mashan and located on present day Atyap land. The people are mainly Christian with mixed farming as their major occupation. Animals used as livestock are predominantly herbivorous, the main exception being the pig and the chicken. The waste management in the urban areas is administered by the state government, while local council are responsible for managing waste in the rural areas. It has an area of 1,666km^2 and a population of 278,202 (National population commission, 2016). The vegetation of this area is of the typical guinea savanna type and has a mean annual temperature of 25^0C and mean annual rainfall of 180mm (Agbaje and Giwa, 2007). It is characterized by wet and dry seasons. Rainfall occurs between the month of April to October with a peak in August (Agbaje and Giwa, 2007). The indigenes are mainly Fantswam people, who migrated from Mashan and located on present day Atvap land. Mixed farming is their major occupation. Animals used as live stocks are predominantly herbivorous, the main exception being the pig and the chicken.

Sample Collection

During the survey, the faecal samples of 203 pigs were randomly collected using a clean unused glove followed by appropriate labelling with the age, sex and location. The samples collected from the pigs were then transported to the Helminthology Laboratory of the Department of Veterinary Medicine, Ahmadu Bello University, Zaria where they were preserved in a refrigerator before processing.

Laboratory Examination

The preserved faecal samples were processed using formol ether concentration technique as described by Bhatia *et al.*, (2010) for the purpose of determining the common helminths. This was done by thoroughly mixing 1g of each faecal sample with 4ml of 10% normal saline using a glass rod in a tube. The emulsion was then filtered using a fine mesh gauze (size 0.1mm) into a conical centrifuge tube. Four millimetre (4ml) of normal saline was further added into the centrifuge tube, capped and mixed well by shaking well. Then 3ml of diethyl ether was added and mixed vigorously for 1min and then centrifuged immediately at 3000rpm for 1min. Then a clean glass rod was used to loosen the layer of the faecal debris from the side of the tube and the tube inverted to discard the ether, faecal debris and normal saline leaving only the sediment. The tube was returned to upright position to allow fluid from the side of the tube to drain to the bottom. The sediment was transferred to a microscope slide and covered with a cover slip. The preparation was examined microscopically using the x10 objective. The types of Helminths eggs observed were identified as describe by William, (2001) and soulsby, (1982).

Data Analysis

Data generated in the study were analysed using descriptive statistics (Tables) and Chi-square test (SPSS version 25) was used to test for association between infection and age and sex, and to check for significant difference in the parasite detected in the two Local Government Areas at 95% confidence interval ($p<0.05$).

Results

Nine types of intestinal helminths were identified, namely; *Ascaris suum* (57%) , *Oesophagostomum dentatum* (37.0%), *Hyostrongylus rubidus* (14.8%), *Metastrongylus elogatus* (8.9%), *Stongyloides* (4.5%), *Stephanurus dentatum* (2.5%), *Trichuris suis* (1.5%), *Globocephalus urosubulatus* (2.0%) and *Physocephalus sexalatus* (1.50%) in Chikun and Jema'a Local Government Areas as shown in Table 1.The distribution of the intestinal helminth parasites in sampled pigs in the two LGAs showed that the main parasites detected from the pigs in Chikun LGA were *Oesophagostomum dentatum* (37.5%), followed by *Ascaris suum* (32.7%), While in Jema'a LGA, *Ascaris suum* (82.8%) followed by *Oesophagostomum dentatum* (36.3%).Significance difference was observed in the detected parasites from the two LGAs ($p<0.05$).

Out of the 203 pigs examined for intestinal helminths infection, 146 pigs were infected with one or more parasites species giving an overall prevalence of 71.9% as shown in Table 2. In Chikun Local Government Area where 104 pigs were examined, 59 pigs were infected giving a prevalence of 56.7%. While out of 99 pigs examined in Jema'a Local Government Area, 87 pigs were found to be infected giving a prevalence of 89.9%.

Pigs with mixed infections were higher than pigs with single infections in both Local Government Areas. In Chikun LGA, pigs with multiple infections with a prevalence of 31.7% were higher than pigs with single infections with a prevalence of 25%. While in Jema'a LGA pigs with mixed infection with a prevalence of 58.6% were higher than pigs with single infection with a prevalence of 29.3% as shown in Table 3. The variation in the number of single and multiple infected pigs from the two LGAs was not significant ($p>0.05$).

Table 1: Prevalence of Intestinal Helminth Parasites in Pigs Sampled in Chikun and Jema'a Local Government Areas of Kaduna State

	Local Government Areas				
	Jema'a		Chikun		Total (%)
Parasites	No. infected	%infected	No. infected	%infected	
Ascaris suum	34	32.7	82	82.8	57.1
Oesophagostomum dentatum	39	37.5	36	36.3	37.0
Hyostrongylus rubidus	08	7.7	22	22.2	14.8
Metastrongylus elongates	06	5.8	12	12.1	8.9
Strongyloide	07	6.7	02	2.0	4.5
Stepanurus dentatum	01	0.96	04	4.0	2.5
Trichris suis	03	2.9	00	0.0	1.5
Globocephalus urobuslatus	01	0.96	03	3.0	2.0
Physocephalus sexalatus	00	0.0	03	3.0	1.5
Total	99	95.2	164	165.7	129.6

(X^2=25.592, df=8, p=0.001<0.05)

Table 2: Overall Prevalence of Intestinal Helminths of Pigs

Local Government Area	No. examined	No. infected	%infected
Chikun	104	59	56.7
Jema'a	99	87	89.9
Total	203	146	71.9

Table 3: Prevalence of single and multiple infections by intestinal helminths among sampled pigs

		Infection			
		Single		Multiple	
LGA/Communities	**No. examined**	**No. infected**	**%infected**	**No.infected**	**%infected**
Chikun					
Goningora	25	7	28.0	10	40.0
Marabarido	43	7	16.3	13	30.2
Sabo	36	12	33.3	10	27.8
Sub Total	**104**	**26**	**25.0**	**33**	**31.7**
Jema'a					
Kafachan 1	44	17	38.6	27	61.4
Kafachan 2	55	12	21.8	31	56.4
Sub Total	**99**	**29**	**29.3**	**58**	**58.6**
Overall Total	**203**	**55**	**27.1**	**91**	**44.8**

(X^2=4.581, df=4, p=0.333>0.05)

The prevalence of intestinal helvminths of pigs in both local government in relation to age and sex is shown in Table 4. Out of the total number of 86 male pigs examined in the study area, 59 (68.6%) were infected. While 87 (74.4%) out of 117 female pigs examined were infected. Intestinal helminth infection was significantly higher in female pigs than male (p<0.05).

The prevalence of intestinal helminths in pig aged 25-36 months (58.6%) is slightly higher than other age group 5-12 months (57.1%) and 13-24 months (55.0%) in Chikun LGA. While the prevalence of intestinal helminths in pig aged 5-12 months (93.0%) is higher than other age group 13-24 months (83.3%) and 25-36 months (79.2%) in Jema'a LGA as shown in Table 5. There was significant difference in the prevalence of intestinal parasites across the different age groups (p<0.05).

The prevalence of intestinal helminths of female pigs (63.9%) was higher than of male pigs (46.5%) in Chikun LGA. However, the prevalence of intestinal helminths of male pigs (90.7%) was higher than of female pigs (85.7%) in Jema'a LGA as shown in Table 6. There was no significant variation observed in the prevalence among the different sexes (p>0.05).

Table 4: Prevalence of intestinal helminths of pigs in relation to age and sex in Chikun and Jema'a Local Government Areas.

Age Group (Month)	Sex					
	Male			Female		
	No. examined	No. Infected	%infected	No. examined	No. infected	%infected
5 – 12	49	38	77.6	43	35	81.4
13 – 24	24	14	50.0	30	23	76.7
25 – 36+	09	07	77.8	44	29	65.9
Total	**86**	**59**	**68.6**	**117**	**87**	**74.4**

Sex-(X^2=10.784, df=2, p=0.005<0.05)
Age-(X^2=8.431, df=2, p=0.015>0.05)

Table 5: Prevalence of intestinal helminthic parasites of pigs sampled in Chikun and Jema'a Local Government Area by age.

Age Group (Month) examined	Chikun			Jema'a		
	No. examined	No. infected	%infected	No. examined	No.infected	%infected
5 – 12	35	20	57.1	57	53	93.0
13 – 24	40	22	55.0	18	15	83.3
25 – 36+	29	17	58.6	24	19	79.2
Total	**104**	**59**	**56.7**	**99**	**87**	**87.9**

(X^2=11.403, df=2, p=0.003<0.05)

Table 6: Prevalence of intestinal helminthic parasites of pigs sampled in Chikun and Jema'a Local Government Area by sex.

Sex	Chikun			Jema'a		
	No. examined	No. infected	%infected	No. examined	No. infected	%infected
Male	43	20	46.5	43	39	90.7
Female	61	39	63.9	56	48	85.7
Total	104	59	56.7	99	87	87.9

(X^2=1.744, df=1, p=0.187>0.05)

DISCUSSION

From this study, a high prevalence of 71.9% was recorded from the pigs examined in both Chikun and Jema'a local government areas, which is an indication of the poor level of environmental hygiene, degree of environmental contamination and lack of adequate knowledge by pig owners on the role of pigs in disease transmission and the need for veterinary care. It was revealed from the study that the prevalence of intestinal helminths of pig was lower in Chikun local government area (56.7%) than Jema'a local government area (87.9%). Comparison of overall prevalence the intestinal helminths are statistically significant ($P < 0.05$). Results from previous studies have shown that the prevalence of intestinal in intensive pig farm is usually considerably lower (Liu and Lu, 2002).

In this study, nine types of intestinal helmimths were identified. Out of the nine helminths identified, *Oesophagostomum dentatum*is was the most prevalent (37.5%) followed by *Ascaris suum* (32.7 %) under Chikun local government area. This contrasts with the findings of past studies where *A. suum* was reported to be the most prevalent in scavenging pigs (Kumar *et al*., 2003; Ngowi *et al*., 2004; Tamboura *et al*., 2006) and also semi intensively managed pigs (Nsoso et al., 2000). The moderately high prevalence of *O.dentatum* could be due to the

ability of the egg to survive for long in the environment (Roepstorff and Murrel, 1997; Pittman *et al*., 2010). However, *A. suum* is the most prevalent in Jema'a local government area with a prevalence of 82.8%. This could also be as a result of egg surviving for long in the environment or probably as a result of ineffective administration of antihelminthics. Hence, there is a need to create awareness as to the possible health risk following human infection of these parasites. It has been reported that *A. suum* is among the causes of visceral larva migrans in human (Sakakibara *et al*., 2002). In addition, human cases with liver and lung lesions as well as cases of epidemics of eosinophilia pneumonia has been reported and *A. suum* specific antibodies were positive in all cases (Arimura *et al*., 2001; Sakakibara *et al*., 2002). *Strongyloides* which had a prevalence of 6.7% and 2.0% in Chikun and Jema'a local government area respectively in this work had the highest in slurries analyzed by Bornay *et al*, (2009). *Stephanurus dentatum* is a kidney worm of pig and one of the intestinal helminths identified in this study, which had the lowest prevalence of 0.96% in Chikun local government area and 4.0% in Jema'a local government area. This is in agreement with findings of past studies where *Stephanurus dentatum* had the lowest prevalence in pigs examined in Ibadan (Sowemimo *et al*, 2014). The low occurrence of *Stephanurus dentatum* egg is because they are very vulnerable to sunlight and drying. Infection of pigs with these parasites could have occurred either by ingestion of infective larvae, by skin penetration or by ingestion of infected earthworms (Soulsby, 1965).

In this study, the overall prevalence of intestinal helminths was significantly higher among female pigs (74.4%) than in male pigs (68.8%) P<0.005. Comparing the two local government area of study, it was revealed that the prevalence of intestinal helminths was higher among female pigs (63.9%) than in male pigs (46.5%) in Chikun local government area. Stratification of infection with respect to sex showed that female pigs were significantly more infected than male pigs (P<0.005) as shown in Table 6.The higher prevalence of female than male could be that female pigs are usually kept for a long period for production than male pigs and are therefore more predisposed to helminth infection. Another reason is that the former are known to have immune-suppression during pregnancy and lactation and easily succumb to helminthiasis. This is in agreement with the findings of Tamboura *et al*, (2006) where female pigs have higher prevalence than male pigs. However, the prevalence of intestinal helminths was higher among male pigs (90.7%) than in female pigs (85.7%) under Jema'a local government area, which is in agreement with findings of past studies where Males pigs have higher prevalence than female pigs (Sowemimo *et al*., 2014). The high rates may be because male pigs are more likely than female pigs to disperse to other colonies or be moved to other pens especially when the females are on heat thereby promoting the dissemination of the helminths. These devastating effects of these parasites on the pig can be prevented by combining an efficient sanitary programme with a good deworming and a balanced nutrition.

From this study, it was recorded that the age group 5-12 (months) had the highest overall prevalence of intestinal helminths of 79.3% followed by age group 25-36 (months) with a prevalence of 67.9% and then age group 13-24 (months) with a prevalence of 63.8%. In comparing the two local government area of study, it was observed that in Chikun local government area the age group 25-36 (months) had the highest prevalence of intestinal helminths of 58.6% followed by age group 5-12 (months) with a prevalence of 57.1% and then age group 13-24 (months) with a prevalence of 55.0%. The highest prevalence of the age group 25-36 (months) is due to prolong exposure of adult pigs to infective stages of the heminths. This is in agreement with findings of past studies where adult pigs have higher prevalence than in growers and piglets (Atawalna *et al*., 2016). There was a significant difference (P < 0.05) in the prevalence of intestinal parasites across the different age groups. The higher infection in the older pigs 25-36 (months) could be because of the older animals picking up more infection over time than in younger animals and the feeding habit of the adult. It was also observed that in Jema'a local government area the age group 5-12 (months) had the highest prevalence of intestinal helminths of 93.0%. This could be due to the lack of immunity of been pre-exposed to this parasites. This finding is agreement with past studies where pigs aged (4-7 months) examined at Ikpa market abattoir, Nsukka metropolis Enugu state had the highest prevalence of intestinal helminths (Eyo *et al*., 2014).

Out of 104 pigs sampled in Chikun local government area, 33 (31.7%) pigs were infected with one or more parasites species, while 26 (25%) pigs had single infections. This is also in agreement with findings in Jema'a local government area where out of 99 pigs were sampled for intestinal helminths and 58 (58.6%) pigs had mixed infections and 29 (29.3%) pigs had single infections. With the higher prevalence of mixed infection, preventive chemotherapy is warranted. This intervention should be coupled with veterinary health education and improved access to clean water and adequate sanitation.

CONCLUSION

Prevalence of intestinal helminthiasis in pigs was influenced by age and sex in the study. Infected pigs could be an important source of transmission of some parasites capable of causing harms to human when infected. All the helminths are of public health importance. Frequently deworming of pigs and management practices to limit exposure of pigs to contaminated feed and feces, raising pig in insect free/screen stall, regular veterinary screening of pigs for helminths, treatment of infected pigs and meat inspection to ensure that infected pigs are not sold to consumers are strategies to control helminth infection. Proper meat inspection practices, rodent control, avoiding garbage feeding to pigs, proper carcass disposal can help control the disease.

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