



MOST COMMON INTESTINAL PARASITES AFFECTING SWINE PRODUCTION PRACTICED IN EXTENSIVE FARMS IN MAYO-BELWA ADAMAWA STATE, NORTH-EASTERN NIGERIA

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ABSTRACT

Intestinal parasites remain a major health problem affecting the profitability of livestock production particularly of swine in Nigeria. Considerably, the prevalence of intestinal parasites is influenced by the farm hygiene. This study was conducted to determine the prevalence of intestinal parasites infection of pigs in some extensive farms in Mayo-Belwa Local Government Area of Adamawa State Nigeria. Faecal samples were collected from 265 pigs comprising 143 males and 122 females from five locations all extensive farms within Mayo-Belwa. Semi-structured questionnaire was used to obtain information on the farm management. The samples were examined for helminth eggs and protozoan oocyst using the concentration (floatation) technique. Out of the 265 pigs examined, 205 (77.40%) were found to be infected. Our findings showed, *Ascaris suum* is the most abundant (34.71%) followed by *Cryptosporidium* spp (25.70%) then *Strongiloides ransomi* (11.70%), *Oesophagostomum* spp and *Trichuris suis* were found to be lower in abundance with (3.02%) and (2.30%) respectively. Out of the 143 male and 122 female pigs examined 113 (79.02%) and 92 (75.40%) were infected respectively. The swine age-distribution of the intestinal parasites showed no significant difference ($p > 0.05$), with the age-group 11-18 weeks having the highest prevalence (82.80), followed by 1-10 weeks age-group with (76.11%) and the age-group >18 weeks having the lowest (66.70%). Prevalence with respect to hygiene level of the breeding environment showed that swine reared in dirty environment recorded the highest prevalence of 90.90% although, no statistically significant difference was observed between breeding environments ($p > 0.05$). High prevalence of intestinal parasites in pigs in Mayo-Belwa calls for intervention policies to control this problem. We recommend also that awareness of farmers regarding their farm's hygiene be taken into consideration.

Key words: Common parasites, extensive farm, Mayo-Belwa, Nigeria, Swine.

INTRODUCTION

Pigs (scientifically known as *Sus scrofa domestica*; the Hausas in northern Nigeria call it "Alade") are omnivores that are commonly domesticated by man and are found in the tropical and temperate parts of the world (Shitta, *et al.*, 2013; Jafta, *et al.*, 2018). Pigs are primarily scavengers as reported by Amuta, *et al.* (2015) and Shittu, *et al.*, (2018) utilizing food scraps thrown away by people, they are known to eating any kind of food including, dead insects, bark of plants, garbage's and even rotting carcasses of other animals (Pam, *et al.*, 2013). The roaming of pigs favours the uptake of intestinal parasite eggs according to

Roepstorff, *et al.* (1998) making the pigs particularly susceptible to infection with intestinal parasites, leading to high morbidity and mortality, reduce feed conversion and weight gain thereby compromising the reproductive performance of pigs as well as efficient and profitable pig farming (Nissen *et al.*, 2011). Earlier, Ajayi *et al.* (1988) reported that intestinal helminthes reduce average daily weight gain by up to 30% in indigenous pigs of all ages. The adult nematodes live in the intestines, grazing on the gut lining and ingesting particulate and liquid digester, thus limiting nutrient uptake by the pigs (Atawalna, *et al*/2016).

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The damage caused by adult intestinal parasites includes hemorrhagic gastroenteritis and anaemia. Larval migration through tissues of the pigs results in spread of infectious organisms from the gut as well as extensive tissue damage thus compromising organ function (Zanga, *et al* 2003, Kahn, 2006, and Shitta, *et al.*, 2013).

Traditionally, pig farming has been practiced in other parts of the world and Nigeria as a way of life of peasant farmers who mainly control the system practiced usually in an extensive way (Shitta, *et al.*, 2013, Kaur, *et al.*, 2017, Shittu, *et al.*, 2018 and Ume, *et al.* 2019). The extensive system of management is usually constrained by susceptibility to parasites and disease, poor management, cultural, social and religious challenges, capital challenges, high cost of inputs, expensive feed for the pigs, poor and unorganized marketing and many other challenges (Ogunniyi and Omotoso, 2011; Muhanguzi *et al.*, 2012, Amadi, *et al.*, 2018 and Ume, *et al.* 2019). Parasitism is a limiting factor against the general performance of pigs and its productivity. Pig parasites can cause ill health in man either through direct consumption of pork products or indirectly through contamination of human environment. Parasites like *Ascaris*, *Cryptosporidium*, *Giardia*, *Taenia species*, *Toxoplasma gondii*, etc. have been reported as major swine zoonosis. Some of these swine zoonosis has been established domestic or peridomestic cycle and reservoirs in wild hogs, boars and warthogs (Amuta, *et al.* 2015).

Knowledge of the occurrence of parasite species could enable the veterinary services understand possible public health threats and develop prophylactic measures to reduce the parasite transmission among pig herds. Since extensive farming of swine in Nigeria are mostly practiced very close to human habitation, the public health hazards of these piggeries could be of great concern to humans, environment and to other livestock. This study therefore, sought to provide and compare information on the hygiene conditions of breeding environment and the common gastrointestinal parasites of the pigs in the study area.

Materials and Methods

Study Area

A cross-sectional study was conducted in Mayo-Belwa Local Government Area of Adamawa State, Nigeria. Adamawa is bordered by other Nigerian states of Borno to the northwest, Gombe to the west and Taraba to the southwest. Topographically, it is a mountainous land crossed by the large river valleys of Benue, Gongola and Yedsarem. The valleys of the Cameroon, Mandara and Adamawa mountains

form part of the landscape. Mayo-Belwa is in the north-eastern Nigeria and in the south-Eastern part of Adamawa State. It lies between latitude 9°12' North of the equator and longitude 12°36' East of the Greenwich Meridian. A typical tropical African village the weather conditions in the area is marked by wet and dry seasons, the wet/rainy season starts from May to October, while the dry season starts from October to April. The area receives between 900 to 1020 mm rainfall annually and a relative humidity ranging from 75% to 80%. Maximum temperature can reach 38°C while the minimum temperature can reach 18°C (Adebayo and Tukur, 1999). The study site included Angwan Zing, Angwan Tavo, Angwan Yandang, Kwanan Kuka and Sabon Pegi all within Mayo-Belwa town. Fifteen (15) extensive pig farms three (3) from each ward) were visited between the hours of 5:00 a.m. and 6:00 a.m. local time when the fresh faecal samples can be found. The method of husbandry adopted by the farmers in these areas was the traditional type (also known as the extensive farming).

Faecal sample Collection

A total of 265 faecal samples from pigs were collected and examined. The sample size was determined according to the Thrusfield formula (Thrusfield, 1997). The faecal samples were collected immediately the pig defecates in the presence of the researcher and directly from the rectum by rectal palpation. The faecal samples were placed in a clean pre-labelled specimen bottles and preserved before being taken to the laboratory. A separate disposable glove and specimen bottles were used for each animal sampled. The pig's identification; age, sex and hygiene condition of the breeding environment were obtained while samples were being collected.

Faecal floatation technique

The faecal samples were carefully examined for the presence of parts of worm or whole. The concentration method (floatation technique) was used to process the fresh stools collected. About 1g of faeces was collected from each sample and was mixed thoroughly with 15ml of zinc sulphate. Using a funnel, the mixture was poured into the centrifuge tube and was centrifuged at 1500-2000 rpm for 5 minutes. In each tube the floatation solution (33% zinc sulphate) was added and filled to the brim, a glass slide was placed on top of the tube. The glass slide was then removed, and a drop of iodine was added. The mixture was covered using a cover slip and examined under low power Olympus CX21 microscope.

Samples identification

Identification of parasite eggs, larvae and cysts was done as described by (Foreyt, 2001; W.H.O. 1991; Cheesbrough, 2005; Cheesbrough, 1992 and Soulsby, 1982).

Herd size and hygiene level questionnaire

A total of two hundred and sixty-five (265) responses on each of the pig sampled were obtained from a semi-structured questionnaire administered to the farm owners. Data on herd size, age-groups, health status of pigs, and anthelmintic treatment regimen were recorded by interviewing the farmers using the semi-structured questionnaire. For the purpose of this study, Pigs between 1-10 weeks of age were considered piglets, 11-18 weeks growers and above 18 weeks adults. Hygiene level of the breeding environment was considered as neat, moderate and dirty when owners clean their piggeries after one day, three days and six days respectively.

Ethical consideration

The study protocols were approved by the University of Jos Ethical Review Committee of the Applied Entomology and Parasitology Unit and consent given by the farmers involved in the study. All applicable international, national, and/or institutional guidelines for the care and use of animals were duly followed.

Statistical analysis

Data obtained in this study were subjected to Statistical Package for Social Sciences (SPSS) version 24 for the analysis of data. The proportions obtained in the study, prevalence of infection among age, sex, and hygiene level of the breeding environment were compared using chi-square test. The confidence level for the analysis was set at 95%, and the level of significance at $p < 0.05$.

RESULTS AND DISCUSSION

A total of 265 faecal samples were collected from pigs and examined during the study period. More than half of the total sample collected, which is 205 (77.40%) were found to be infected with intestinal parasites. In order of prevalence of the parasites, *Ascaris suum* occurred more (34.71%) followed by *Cryptosporidium spp* (25.70%) then *Strongiloides ransomi* (11.70%), *Oesophagostomum spp* and *Trichuris suis* occurred least with (3.02%) and (2.30%) respectively. The prevalence of gastrointestinal parasites with respect to age showed high infection rate in Growers 82.80% than Piglets 76.11% followed by Adults who had the lowest infection rate 66.70% Table 1. This study revealed that the gastrointestinal parasites infection might have a real impact on the pig's

farms productivity, however the percentage of the infected pigs was found to be high in the study (77.40%) in swine. This result agrees with those obtained by Amuta *et al.* (2015) in Makurdi, Benue State Nigeria with a prevalence of 74.80%. The prevalence observed in this study, is higher than 35.80% recorded in pigs from the Teaching and Research farm of the University of Ibadan, Oyo State South - West Nigeria by Sowemimo, *et al.* (2012), and 42.70% recorded in pigs by Amadi, *et al.* (2018) in Umuahia North, Abia State South-East Nigeria. The low prevalence observed is a clear indication of an effective and efficient management of pigs in those farms, both in Oyo and Abia States. The high prevalence in this study however, is an indication that the favourable environmental condition promotes the survival and development of pre-infective stages of the parasites as well as the limited veterinary care of the pigs, this could result in poor implementation of any piggery industry in the study area and the country at large (Sama, and Gogai, 1986; Amuta, *et al.* 2015).

Suitable optimum weather condition of high humidity (ranging between 75% to 80% as recorded during the study) resulting from rainfall satisfies the optimum environmental requirement needed for the development of parasites eggs and ensures a prolonged survival of larvae in the soil which increases the possibility of host infection. The feeding habit of pigs could also contribute to the high level of parasitic infection as variously reported by Eusebio (1980), Ajayi *et al.* (1988), Tidi *et al.* (2011), Shitta and Ella, (2013), and Asambe, *et al.* (2019). During the study it was observed that poor management practices was a factor that could also contribute to high infection rate and this was evident in the faecal material that could accumulate and remained accessible to the pigs.

Ascaris suum was the most prevalent among the parasites encountered during this study. The low prevalence of *Trichuris* and *Eimeria* species was not surprising as this can be attributed to the existence of possible acquired immunity by the pigs. This is in keeping with the study by Ajayi *et al.* (1988) who observed that, out of 97% of pigs that excretes parasitic eggs, interestingly 90% were found to excrete *Ascaris suum*. Similarly, Salifu *et al.* (1990) presented a result of high prevalence of *Ascaris suum* (60%) while Roepstorff *et al.* (1998) attributed the high prevalence of *Ascaris suum* to differences in breed and production systems. The low prevalence of *Trichuris* and *Eimeria* agrees with earlier studies by (Zanga, *et al.* 2003 and Nathaniel *et al.*, 2017). The infection was higher among the growers than the piglets while the

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adult hosts were the least infected. This finding conforms to the report by Ajayi *et al.* (1988) and Blood and Radosites, (1995) who reported that piglets and growers were more infected by intestinal parasites than the adults. This might be due to much attention and care given to the adults for pork and commercial benefits as observed by the researcher during the study

than the piglets and growers. The animals (growers and piglets) are often left to roam and fane for themselves predisposing them to infective stages of these parasites while adults are properly handled to provide an immediate benefit of a good market value and a good pork value as well (Cox, 2004 and Arun *et al.* 1989).

Table 1: Age-related prevalence and distribution of gastro-intestinal parasites of swine encountered during the study

Age (weeks)	NE	NI (%)	AS (%)	C spp (%)	SR (%)	Oe spp (%)	TS (%)
Piglets (1-10)	201	153(76.11)	59(29.35)	42(20.90)	15(7.50)	5(2.50)	-
Growers (11-18)	58	48(82.80)	29(50.0)	22(37.93)	13(22.41)	2(3.45)	3(5.20)
Adult (< 18)	6	4(66.70)	4(66.70)	4(66.70)	3(50.00)	1(16.70)	3(50.00)
Total	265	205(77.40)	92(34.71)	68(25.70)	31(11.70)	8(3.02)	6(2.30)

Key: NE = Number examined, NI = Number infected, AS = *Ascaris suum*, SR = *Strongyloides ransomi*, Oe = *Oesophagostamum* spp, TS = *Trichuris suis*

An overall occurrence of parasites in relation to sex is presented in Table 2. Infection rate was highest in male (Boars) 79.02% than the female (Sows) 75.40%. However, there was no significant difference statistically in the infection rate between the sexes ($p > 0.05$). With respect to sex, male and female host had similar

infection (79.02% and 75.40%). This shows an equal level of exposure of the swine to parasite when scavenging for food. This finding agrees with the studies of Fabiyi, (1979) Sowemimo, *et al.* (2012), Shitta and Ella, (2013) and Amuta, *et al.* (2015) who also reported similar infection between the males and female pigs.

Table 2: Sex-related prevalence and distribution of gastro-intestinal parasites of swine encountered during the study

Sex	NE	NI (%)	AS (%)	C spp (%)	SR (%)	Oe spp (%)	TS (%)
Sows (Female)	122	92(75.40)	41(33.61)	31(25.41)	12(9.84)	3(2.46)	3(2.50)
Boars (Male)	143	113(79.02)	51(35.70)	37(25.90)	19(13.23)	5(3.50)	3(2.10)
Total	265	205(77.40)	92(34.71)	68(25.70)	31(11.70)	8(3.02)	6(2.30)

Key: NE = Number examined, NI = Number infected, AS = *Ascaris suum*, SR = *Strongyloides ransomi*, Oe = *Oesophagostamum* spp, TS = *Trichuris suis*

The prevalence of gastrointestinal parasites with respect to hygiene level of the breeding environment of swine is shown in Table 3. The highest prevalence was recorded from swine bred in environment with dirty hygienic conditions (90.90%), while the lowest prevalence was observed among swine bred in neat environment (69.60%). However, there was no significant difference statistically in the prevalence of gastrointestinal parasites with

respect to hygiene level of the breeding environment ($p > 0.05$). The prevalence of gastrointestinal parasites with respect to hygiene level of the breeding environment of swine reveals a higher infection recorded from swine bred in the dirty hygienic condition than those swine bred in a neat environment. This is understandably so, because parasites hardly thrive in a neat environment, this was also corroborated by Arun *et al.* (1989).

Table 3: Farm hygiene-related prevalence and distribution of gastro-intestinal parasites of swine encountered during the study

Hygiene	NE	NI (%)	AS (%)	C spp (%)	SR (%)	Oe spp (%)	TS (%)
Dirty (After 6 days)	110	98(89.10)	48(43.64)	28(25.50)	12(10.90)	4(3.64)	3(2.72)
Moderate (After 3days)	98	67(68.40)	27(27.55)	21(21.43)	13(13.30)	3(3.10)	3(3.06)
Neat (After 1day)	57	40(70.20)	17(29.82)	19(33.33)	6(10.53)	1(1.80)	-
Total	265	205(77.40)	92(34.71)	68(25.70)	31(11.70)	8(3.02)	6(2.30)

Key: NE = Number examined, NI = Number infected, AS = *Ascaris suum*, SR = *Strongyloides ransomi*, Oe = *Oesophagostomum* spp, TS = *Trichuris suis*

Cross-infections of *Ascaris suum* in human host are possible as pigs appear to act as reservoir hosts for disseminating human ascariasis which are of public health significance (Arun *et al.* 1989). However, this study suggests that in a community setting, where pigs are reared and pork meat is consumed, a large section of the population in such area could be significantly involved in Zoonotic helminthiasis, deworming program for the pigs should be designed as a form of prophylactic against intestinal parasites and those consuming the pork should be given education on how to properly process the pork for consumption. Improved biosecurity measures with routine public enlightenment of the pig farmers on personal hygiene to prevent transmission of zoonotic diseases will help in the prevention and control programs.

CONCLUSION

The study provides basic information about the distribution and spread of intestinal parasite of swine. The overall result indicated that three species of intestinal parasites commonly infect pigs in the study area. This suggests that helminthes control measures for pigs should be concentrated on the dominant parasite species.

Conflict of interest

The authors declare that there is no any conflict of interest.

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