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Prevalence of Gastrointestinal Helminthes in Pigs Reared in Research Farms of Michael Okpara University of Agriculture, Umudike, South Eastern Nigeria

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ABSTRACT: Gastrointestinal parasitism in swine production is a world-wide problem especially in tropical resource-poor countries. These infections in animals result in significant economic losses. This study aimed to assess the prevalence and spectrum of gastrointestinal parasites of pigs reared in two research farms in Michael Okpara University of Agriculture, Umudike, South eastern Nigeria. From April, 2016 to July, 2016, 220 samples of pig faeces from two research farms (CASAP Research Farm and MOUAU Commercial Pig Farm) were analyzed using floatation and direct smear methods to identify varied parasitic stages present in the faeces. Data generated showed an overall prevalence of 64.6% (142/220) in the two farms. Five parasite species made up of four Nematode and one Cestode were observed namely Ascaris suum (26.4%), Trichuris suis (26.4%), Strongyloides spp (21.9%), Oesophagostomum dentatum (20.0%) and Pseudanoplocephala spp. (5.6%). Mixed infections were also observed. Those within the ages of 0-8months had the highest prevalence (74.12%). Further, 67.42% male pigs and 62.60% of female pigs were found to be infected with one or the other endoparasite revealing a high prevalence of parasitic problems within Umudike. It is recommended that pigs should be treated regularly to prevent or reduce infection to the barest minimal level.

Keywords: Abia State; Cestode; Faecal samples; Gastrointestinal parasites; Nematode pig farming; Umudike.

انتشار الديدان المعوية في الخنازير التي تربى في المزارع البحثية التابعة لجامعة مايكل أوكبارا للزراعة، أوموديكي، جنوب شرق نيجيريا

أبوبي تشارلز أمايه، ميراكل انوسنت دايك ، أونيني مكبولا أوكاي و بلسينج أوزواماكا ايجيكي

الملخص: يعتبر التطفل المعدي المعوي في إنتاج الخنازير مشكلة عالمية خاصة في البلدان الفقيرة بالموارد الاستوائية. هذه العدوى في الحيوانات تؤدي إلى خسائر اقتصادية كبيرة. هدفت هذه الدراسة إلى تقييم انتشار الطفيليات المعدية المعوية للخنازير التي تمت تربيتها في مزرعتين بحثيتين في جامعة مايكل أوكبارا للزراعة، أومونديك، جنوب شرق نيجيريا، من أبريل 2016 إلى يوليو 2016، تم تحليل 220 عينة من براز الخنازير من مزرعتين بحثيتين (مزرعة أبحاث *CASAP* ومزرعة *MOUAU* التجارية للخنازير) باستخدام طرق التحليل المختلفة لتحديد المراحل الطفيلية المتنوعة الموجودة في البراز. أظهرت البيانات الناتجة انتشارًا إجماليًا بنسبة 64.6٪ (220/142) في المزرعتين. لوحظ وجود خمسة أنواع من الطفيليات مكونة من أربعة نيماتودا و سيستود واحد وهي الصَّفَرُ الخِنْزِيرِيّ (26.4٪) ، الدودة السوطية الخنزيرية (26.4٪) ، الأسطوانيات البرازية (21.9٪) ، العقدية (20.0٪) وسيدانوبلوسفالا. (5.6٪). كما لوحظت عدوى مختلطة كانت أعلى نسبة انتشار بين الأطفال الذين تتراوح أعمارهم بين 0-8 أشهر (74.12٪). علاوة على ذلك، وجد أن 67.42٪ ذكور الخنازير و 62.60٪ إناث الخنازير مصابة بواحد أو الطفيل الداخلي الآخر مما يكشف عن انتشار كبير لمشكلة الطفيليات داخل *Umudike*. وتوصي نتائج هذه الدراسة بعلاج الخنازير بانتظام لمنع أو تقليل العدوى إلى أدنى حد ممكن.

الكلمات المفتاحية: ولاية أبيا؛ الديدان، عينات البراز، طفيليات الجهاز الهضمي، تربية الخنازير النيماتودا، أومونديك.

1. Introduction

Pig farming has become a significant source of economic growth for many countries that are dependent on agriculture such as Nigeria [1]. Increasing development has led to rapid and rising demand for animal protein. The benefits of pig farming include promoting the socio-economic status of the populace since the pig has the advantage of being highly prolific when compared to other livestock [2]. Pigs can convert more energy and nutrients into protein and as a result they grow faster. They survive and produce more by consuming small amounts of low-quality food, and hence do not need much involvement in terms of labour and feeding costs [3]. Despite the advantages of pig production outlined, quite a number of factors militate against growth in the industry, factors such as poor veterinary services, lack of credit facilities, non-usage of modern technological advancement and great loss due to endemic disease, especially helminthic diseases. Helminthiosis constitutes a major impediment to efficient and profitable pig production worldwide [4,5]. Gastrointestinal parasites occur in pigs in all production systems and parasites have been identified in both intensively and extensively managed pigs, as well as in pigs kept on research farms. Thus, pigs will likely play a role as a reservoir of parasites of humans [3,6,7]. Due to the fact that parasites rarely cause clinical disease in pigs, little attention has been paid to the animal. Commonly encountered important intestinal parasites of pigs include *Ascaris suum*, *Oesophagostomum spp*., *Hyostrongylus rubidus*, *Ascarops strongylina*, *Physocephalus sexalatus, Strongyloides ransomi* and *Trichuris suis* [8].

The objective of this study was to estimate the prevalence and spectrum of gastrointestinal parasites of pigs reared in two research farms in Umudike, Abia State, Nigeria. This will improve the understanding of their epidemiology and transmission in order to guide effective control.

2. Methodology

2.1 Study Area

The study was carried out in Michael Okpara University of Agriculture (MOUAU) Umudike in Ikwuano Local Government Area of Abia State. MOUAU is located at latitude $5^{0}40^{1}$ and $6^{0}4^{1}$ north, and longitude $7^{0}10^{1}$ and $7^{0}\,34^{1}$ east of Ikwuano local government area. The climate is purely tropical with wet and dry seasons. The rainy season goes from March to October while the dry season is from November to February. The mean daily rainfall and relative humidity are 146.5 mm and 80% respectively. The mean daily temperature ranges from 21.9 ^{0}C to 31.5 ^{0}C. Michael Okpara University of Agriculture Commercial Pig Farm and its Research Pig Farm are supervised by the College of Animal Science and Animal Production (CASAP). The swine unit consists of breeding, farrowing, finishing and experimental pens. The pens are stocked with different breeds of pigs comprising pure Duroc, strains of large white, Hamphire and local breeds. The total number of pigs in the swine unit at the time of sampling which took place between April-July 2016 was 172 pigs in MOUAU Commercial Pig Farm and 70 pigs in CASAP Research Pig Farm. The parent stock was sourced from reputable commercial pig farms operating intensive production systems. Fenbendazole and ivermectin were the two anthelminthic treatments administered three months earlier, prior to the study.

2.2 Collection and examination of fecal samples

Fecal samples were collected from 220 pigs for parasitological examination. The faecal samples were collected directly from the rectum of the pigs with a pair of forceps, a disposable hand glove, or just as they were being dropped on the ground while watching. About 5 g of each captured faecal sample was put in a separate screw cap bottle containing 10% of formalin and was properly labeled indicating the age and sex of the pigs. These were then transported immediately to the department of Zoology and Environmental Biology laboratory of Michael Okpara University of Agriculture Umudike for examination and identification.

2.3 Floatation technique

This method was demonstrated by [9]. About 3 g of faecal sample was emulsified in 30 ml of distilled water in a beaker and thereafter filtered using sieves of various mesh sizes (30, 60 and 90 mm). The strained material was immediately transferred into centrifuge tubes and centrifuged at 1,500 revolutions per minute (rpm) for 5 minutes. The clear supernatant in each tube was discarded and sugar solution of specific gravity (specific gravity of 1.2) was added to the sediment in each centrifuge tube until a convex meniscus was formed. Each tube was then covered with a glass cover slip and allowed to stand for 10 minutes. Each cover slip was then gently lifted from each tube and placed on a clean grease-free slide and examined under the ×10 and ×40 objectives of the microscope for the presence of eggs of helminth parasites.

2.4 Direct Smear method

This method was also demonstrated by [9]. A small quantity of the faecal sample was placed on the clean grease-free glass slide with a glass rod and a smear was made. A drop of 1% normal saline was added and thoroughly mixed with the sample. The slide was covered with a cover slip and examined under a microscope for the presence of eggs of helminth parasites. The eggs of helminths were identified using keys adopted by [10].

2.5 Data Analysis

Differences in the prevalence of parasite infections between age groups and sex were analyzed using Chi-square tests at a level of P = 0.05.

3. Results

Two hundred and twenty pigs were examined for the presence of intestinal parasites from two farms namely CASAP Research Farm and MOUAU Commercial Pig Farm. A total of one hundred and forty two pigs (142) were infected giving an overall prevalence of 64.55% (Table 1), in the two farms. Fifty eight (58) pigs were examined from CASAP Research Farm while one hundred and sixty two (162) were examined from MOUAU Commercial Farm. There was no significant difference in the prevalence from either farm (P > 0.05).

Overall, sex related prevalence was higher in the males than in the females (Table 2). There was no significant difference in the sex prevalence (P>0.05)

Those animals aged 0-8months had the highest prevalence (74.12%) in both the different farms (Table 3). The prevalence amongst the different ages was significant (P < 0.05)

Five parasite species made up of four Nematodes and one Cestode were observed namely *Ascaris suum* (26.4%), *Trichuris suis* (26.4%) ,*Strongyloides spp* (21.9%), *Stephanurus dentatus* (20.0%) and *Cestode/Pseudanoplocephala spp* (5.6%),(Table 4). Mixed infections were also observed. The combinations of *Trichuris suis* and *Strongyloides spp* (29.41%) and of *Ascaris suum*, *Trichuris suis* and *Strongyloides spp* (29.41%) occurred most frequently (Table 5).

Table 1. Prevalence of Infection by Farms.

Farm	No. examined	No. infected	Percentage of infection
MOUAU commercial farm	162	102	62.92
CASAP Research farm	58	40	68.97
Total	220	142	64.55

Df =1, X^2 =3.5, P >0.05

Table 2. Sex Related Prevalence among the Pigs.

Sex	No. examined	No. infected	Percentage of infection (%)
Male	89	60	67.42
Female	131	82	62.60
Total	220	142	

Df =1, X^2 =2.8, P>0.05

Table 3. Age Related Infection rate among the Pigs.

Age (months)	No. examined	No. infected	Percentage of infection (%)
0-8	85	63	74.12
9-16	99	60	60.61
>16	36	19	52.77

Df =3, X^2 =6.5, P < 0.05

Table 4. Prevalence of single parasite infection.

Parasites	No. infected	Percentage of infection
Ascaris suum (N)	33	26.4
Trichuris suis (N)	33	26.4
Strongyloides spp (N)	27	21.6
Oesophagostomum dentatum	25	20.0
Pseudanoplocephala spp.	7	5.6
Total	125(56.82)	

Df =4, X^2= 7.8, P > 0.05

Table 5. Prevalence of mixed parasite infection.

Parasites	No. infected	Percentage of infection (%)
TS+SS	5	29.41
SS+OD	2	11.76
AS+PS	1	5.88
AS+TS	3	17.65
AS+TS+PS	5	29.41
AS+TS+OD	1	5.88
Total	17 (12.0%)	

Key:
TS= *Trichuris suis*
SS= *Strongyloides spp*
AS=*Ascaris suum*
OD= *Oesophagostomum dentatum*
PS=. *Pseudanoplocephala spp*

4. Discussion

Pig farming has become a significant source of economic growth for most tropical countries. Helminthic diseases have been reported to be a major impediment to efficient and profitable pig production worldwide [1]. The present study aimed at determining the spectrum and prevalence of gastrointestinal parasites of pigs managed in two research farms at Michael Okpara University of Agriculture, Umudike, Abia State, south eastern Nigeria. The results of this work revealed a high prevalence of infection of 64.6% among the pigs investigated. This result agrees with the findings of [11] who reported a prevalence of 64.6% in pigs in Shimoga region of Karnataka. Higher rates of 68.7%, 79.2%,80%, 92.7% and 100% gastrointestinal parasitic infection have, however, been reported in pigs reared in several countries such as West Indies, South Africa, Burkinafaso, Nigeria and Gabon [12,13,14,6]. It would seem that the infection was low compared to these other findings. This seemingly low prevalence compared to these other studies could be as a result of the management practices in the farms that were visited, such as daily cleaning and disinfecting of the pens, giving high quality commercial feed in addition to self-prepared feed containing ingredients such as maize grain, cassava and plantain peels, and to the application of anthelminthic drugs to the pigs. Anthelminthic drugs such as fenbendazole and ivermectin were being administered on a three months' basis in the farms studied to help minimize the survival and transmission of parasites within the host system. The results obtained in this study could, however, also be influenced by the period of the investigation (April to July) which happens to be the rainy season period. The rainy season is favorable for the survival, development and transmission of parasitic infections. High stocking density on the farms is also a factor that would have affected the prevalence rate of the parasites in the farms. High stocking density increases the contamination of the environment with these parasitic eggs or larvae and thus makes the infective stages more accessible to susceptible animals. Lower parasitic prevalences of 37.77%, 38.8% and 42.7% in pigs of India and Nigeria have been reported [15,16,17]

Five intestinal parasites of veterinary importance were observed in the study: four nematodes (*Ascaris suum, Trichuris suis, Strongyloides spp, Oesophagostomum dentatum)* and one cestode (*Pseudanoplocephala spp).* However, a previous study in Nigeria by [17] identified eight parasites, *Ascaris suum, Trichuris suis* and *Strongyloides spp* included [13]. In South Africa four parasites including *Ascaris suum* and *Trichuris suis*. *A. suum* and *T. suis* have been observed to affect growing animals, as compared to *O. dentatum* that affects adult animals. This is in accordance with the present study, in which both these parasites were found to be most prevalent when compared to others. The transmission of all these parasites is faecal-oral and direct, via eggs containing an infective third stage larva (L3) as in the case of *A. suum* and *T. suis,* and free living L3 as seen in *O. dentatum. The* relatively low spectrum of parasites observed could be linked to the intensive husbandry system used in raising the pigs.

The overall prevalence (26.4%) of *A. suum* in this study was similar to a study from India [18], who recorded a 27.5% prevalence rate. It was, however, lower than the prevalence recorded for other studies, namely 40% by [14] in Bukinafaso, and 44.5% by [13] in South Africa. Lower prevalence rates of 11.1% and 14.7% were recorded in Nigeria

[16,17] In the present study, *Trichuris suis* occurred in similar proportions of 26.4%. This is higher than the report of [16,17] who recorded 12.2% and 0.7% rates respectively. Higher prevalence of 50.6% of *T. suis* was reported in South Africa [13]. The higher prevalence of *A. suum* and *T. suis* in this study might be connected to the fact that eggs of whipworms are hard and so can withstand adverse environmental conditions for a long period of time [19].

The prevalence of *Strongyloides spp* observed in the present study (21.9%) is similar to the findings of [14] in Bukinafaso, who reported a 21% rate. It is, however, higher than the report of [17] in Nigeria who recorded a 2.0% prevalence rate. The level of infection observed in this study might be due to the atmospheric conditions (rainy season) which favoured the proliferation of the parasite. The larvae require the right environmental temperature and moisture content for development and survival of the eggs.

The prevalence of *Oesophagostomum dentatum* observed in the present study (20.0%) is higher than the findings of [16] 1.1% prevalence rate. Most workers in other parts of the world did not report this parasite. The parasite might be location specific. The prevalence of *Pseudanoplocephala spp.* was observed in the present study (5.6%). It was however the least prevalent. This was lower than the findings of [20] in Nigeria who reported a 17% prevalence rate. Transmission of *Pseudanoplocephala* spp from pigs to humans has been established; therefore it could be zoonotic and hence a public health concern.

In terms of infections, single infections were more prevalent (56.8%) than mixed infections (12.0%). This also agrees with the findings of [16]. Mixed infections were also observed, namely the combinations of *Trichuris suis* and *Strongyloides spp* and that of *A*scaris suum, *Trichuris suis* and *Strongyloides spp.* [7] reported similar findings in Nigeria. Polyparasitism in pigs is a common phenomenon which shows the rate of transmission to man. The piglets of 0-8months were more infected in the two farms combined (74.12%) than the other pigs in the different age groups. Piglets are more susceptible to parasitic infection as their immune systems are still in the development process and they may not be able to resist infection like the older pigs. Similar observations have been made by others [16, 21].

In the present study, more males (67.42%) were infected than the females (62.60%). This is in consonance with the report of other authors in Nigeria and Botswana [16,22] but contrasts with the reports of [14,23]. Previous workers, however, attributed a higher prevalence rate in females due to a decreased resistance in females especially in relation to pregnancy and lactation. Our present result may possibly not show this effect because the female pigs may have had a stronger host genetic resistance compared to the males.

The results of this work provide a baseline data about the parasite fauna in intensively managed pig farms in Michael Okpara University of Agriculture, Umudike. This would go a long way to help plan and improve on the present management practices already in place to reduce parasitic infection of pigs.

5. Conclusion

This work has revealed the prevalence of infection with intestinal parasites among the pigs studied (64.55%). The piglets of 0-8months were more frequently infected than the pigs in other age groups. It is also evident that pig faeces could be a source of re-infection to the pigs if they are not cleaned out on time. Eating infected or improperly cooked pork meat could infect the consumer (zoonosis). In view of this, it is recommended that pig pens should be cleaned on a regular basis and should be treated regularly to prevent or reduce infection to the barest minimum level.

Conflict of interest

The authors declare no conflict of interest.

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Ethical statement

The protocol was approved by the ethical committee of Michael Okpara University of Agriculture, Umudike.

References

1. Ohaeri, C.C.,and Okoro, C.T. Gastrointestinal parasites of pigs in a commercial farm in Isiala-Ngwa North, Abia State, Nigeria. *Nigerian Journal of Parasitology*, 2012, **33(1)**, 63-66.
2. Tufare, A., Awol, N., Tadese, F., Tsegaye, Y.,and Hadush, B. Parasites of pigs in two farms with poor husbandry practices in Bishoftu, Ethiopia. *Onderstepoort Journal of Veterinary Research*, 2015, **82**, 1-5.
3. Kristina, R., Ian, D., Maximilian, B., Michel, D., Delia, G., and Peter-Henning, C. Prevalence and risk factors for gastrointestinal parasites in small- scale pig enterprises in central and Eastern Uganda. *Parasitology Research*, 2017, **116**, 335-345.

4. Nissen, S., Poulsen, I.H., Nejsum, P., Olsen, A., Roepstorff, A., Rubaire-Akiik, C. and Thamsborg,S.M. (2011). Prevalence of gastrointestinal nematodes in growing pigs in Kabale District in Uganda. *Tropical Animal Health Production*, 2011, **43**, 567-572.
5. Obonyo, F.O., Maingi, N., Githigia, S.M., and Ng'ang'a, C.J. Prevalence, intensity and spectrum of helminthes of free range pigs in Homabay District, Kenya. *Livestock Research for Rural Development*, 2012, **24**,48.
6. Maganga, G.O., Kombila, L.B., Boundenga, L., Kinga, I.C.M., ObameNkoghe, J., Tchoffo, H., Gbati, O.B., and Awah Ndukum, J. Diversity and prevalence of gastrointestinal parasites in farmed pigs in South east Gabon, central Africa. *Veterinary World*, 2019, **12**, 1888-1896.
7. Abonyi, F.O.,and Njoga, E.O. Prevalence and determinants of gastrointestinal parasite infection in intensively managed pigs in Nsukka Agricultural zone, South east, Nigeria. *Journal of Parasitic Diseases*, 2020, **44(1)**, 31-39.
8. Nansen, P. and Roepstorff, A. Parasitic helminthes of the pig: factors influencing transmission and infection levels. *International Journal of Parasitology*, 1999, **29**, 877-891.
9. Cheesbrough M**.** District Laboratory Practice in Tropical countries (Part 1), Cambridge University Press, 2013.
10. Soulsby, E.J.L. Helminths, Arthropods and Protozoa of Domesticated Animals**.** 7th Edition Bailliere Tindall, East Sussex, UK, 1982.
11. Krishna Murthy, C.M., Ananda, K.J., Adeppa, J and Satheesha, M.G.Studies on gastrointestinal parasites of pigs in Shimoga region of Karnataka. *Journal of Parasitic Disease*, 2016, **40(3)**, 885-889.
12. Tiwari, K.P., Chikweto, A., Belot, G., Vanpee, G., Deachie, C., Stratton, G.,and Sharma, R.N. Prevalence of intestinal parasites in pigs in Grenada, West indices. *West Indian Veterinary Journal*, 2009, **9**, 22-27.
13. Nwafor, I.C., Roberts, H.and Fourie, P. Prevalence of gastrointestinal helminthes and parasites in small holder pigs reared in the central Free State Province. *Ondersteport Journal of Veterinary Research*, 2019, **86**(1), a1687.
14. Tamboura, H.H., Banga-Mboko, H., Maes, D., Youssaoa, I., Bayala, B.and Dambele, M.A. Prevalence of common gastro-intestinal nematode parasites in scavenging pigs of different ages and sexes in eastern centre and province, Burkina Faso. *Onderstepoort Journal of Veterinary Research*, 2006, **73**, 53-60.
15. Laha, R., Das, M., Goswami, A., Sailo, B., Sharma, B.K., Gangmei, D., Puii, L. H., Patra, M. K., Das, R.K., Sharma, A., Ngullie, E. Prevalence of gastrointestinal parasitic infections in pigs of north eastern region of India. *Indian Journal of Hill Farming*, 2014, **27**(1), 64-67.
16. Sowemiwo, O.A., Asaolu, S.O., Adegoke, F.O.and Ayanniye, O.O. Epidemiology survey of gastrointestinal parasites of pigs in Ibadan, Southwest Nigeria. *Journal of Public Health Epidemiology,2012*, **14**, 294-298.
17. Amadi, A.N., Ubiaru , P.C., Ugagu, G.M., Ibediugha, B.N., Obeagu, I.A.and Njikeonye, A. Preliminary study on the prevalence of gastrointestinal parasites of pigs managed and slaughtered in Umuahia North Local Government Area of Abia State, Nigeria. *Animal Research International*, 2018, **15**(2), 3013-3019.
18. Kaur, M., Singh, B.B., Sharma, R. and Gill, J.P.S. Prevalence of gastrointestinal parasites in pigs in Punjab, India. *Journal of Parasitic Disease*, 2017, **41(2)**, 483-48.
19. Urquhart, G.M., Armour, J., Duncan, J.L., Dunn, A.M.and Jennings, F.W. Veterinary Parasitology,2nd Edition.Wiley-Blackwell, Science Ltd, New York, 1996.
20. Olaniyi, A.J. Public Health implications of gastrointestinal parasites of pigs in Kwara state, Nigeria. *Journal of Animal and Veterinary Advances*, 2014, **13**, 783-785.
21. Okoroafor, U.P.,Unigwe, C.R.,Okorofor, J.C., Isegbe, E.I., Ogbu, U.M.,and Atoyebi, T.J. A survey of gastrointestinal parasites of pigs that arrived for slaughter at Bodija abattoir, Ibadan, Oyo State, Nigeria. *International Journal of Pure and Applied Science and Technol*ogy, 2014, **20(2)**, 53-57.
22. Nsoso, S.J., Mosala, K.P., Ndebele, R.T.,and Ramabu, S.S.The prevalence of internal and external parasites in pigs at different ages and sexes in southeast district, Botswana. *Onderstepoort Journal of Veterinary Res*earch, 2000, **67**, 217-22.
23. Atawalna, J., Attoh-Kotoku, V., Folitse, R.D.and Amenakpor, C. Prevalence of gastrointestinal parasites among pigs in the Ejisu municipality of Ghana. *Scholarly Journal of Agriculture and Veterinary Science*, 2016, **3(1)**, 33-36.

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