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Seroprevalence of Cysticercosis and Intestinal Parasitism in Pigs in Jos Metropolis

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Abstract: The prevalences of cysticercosis and intestinal parasitism in pigs were carried out in Jos metropolis between June 2006 and April 2007. A total of 63 pigs were examined serologically for the qualitative screening of serum IgG antibodies to *Teania solium* using Enzyme Linked Immunosorbent Assay (ELISA, Diagnostic Automation, INC. Calabasas). The prevalence of intestinal parasitism was determined using the Formal-Ether concentration method by examining 115 pigs. Twenty nine pigs were positive for cyticercosis giving a seroprevalence rate of 46.0%. While, 107 pigs were positive for intestinal parasitism giving a prevalence rate of 86.9%. The distribution of the individual parasites in the pigs were as follows; *Strongyloides* sp. (7.8%) *Oesophagostomum* sp. 46. 0%, *Emeria* sp. 15.6%, *Oesophagostomum/Ascaris suum* 9.5%, *Ascaris suum* 4.3%, *Emeria* sp. 15.6% *Dicrocoelium* sp. 2.6% *Trichuris* sp. 0.8%. Cases of double infection showed that *Oesophagostomum* occured frequently with *Ascaris suum*. There was a significant relationship, with the prevalence of intestinal parasitism in relation to lack of regular deworming of the pigs ($p<0.05$). However, Seroprevalence of cysticercosis had no significant relationship with gender, nor location. The high seroprevalence rate of cysticercosis and high prevalence of parasitic infections in the study was due to poor management practices as shown by poor sanitary conditions. This study has shown, a high seroprevalence of cysticercosis and high prevalence of intestinal parasitism among pigs in Jos metropolis indicating that they are important although, under-recognised problems in pig raising regions in the country. The study also, indicated that the parasites observed in the study abound in Nigerian pigs and there presence are influenced by hygiene and therefore, are a major constraint to the swine industry. Therefore, successful control programmes need to be put in place and more surveys be conducted on this important zoonoses and other intestinal parasites in different parts of the country where, pigs are reared and consumed. In addition, economic losses due to the condemnation of heavily infected carcasses is also enormous.

Key words: ELISA, cysticercosis, seroprevalence, intestinal parasitism, pigs, jos

INTRODUCTION

Pigs play a major role in the socio-economic life of the people of middle-belt State of Nigeria. The pig population of Nigeria is 3.4 million (Majiyagbe and Lamorde, 1997). They serve as one of the major sources of income for the rural population around this region and play an important cultural role that cannot be measured in monetary value (Luther *et al*., 2007). The swine industry has witnessed an unprecedented increase in production and consumption over the past decade and this situation is likely to continue. This positive development mean an increase in: provision of animal protein for human consumption, employment generation, poverty reduction, contribution to the Nation's Gross domestic Product and general economic growth (Oluwafemi, 2008).

The occurrence of diseases like porcine cysticercosis in pigs caused by the larval form of a tapeworm (*Taenia solium)* that infects both humans and pigs and intestinal parasitism conversely affects the productivity of pigs and therefore constitute an important constraint to the pig industry in most parts of Nigeria and the world at large (Onah and Chiejina 1995; Bakut *et al*., 1997).

The pig is the natural intermediate host of the tapeworm. In places with inadequate disposal of human faeces, pigs ingest stools containing *T. solium* eggs, cysticerci lodge any, where in the body of the pig, most commonly in the muscle and subcutaneous fat. Although, some pigs have massive infections, porcine cysticercosis is rarely associated with symptoms of any kind. Most pigs are killed before the age of nine months, which is too short a time for the cysts to reach the degenerative stage that is associated with symptoms in human beings (Hector *et al*., 2003). Cysticercosis, due to *T. solium* is typically associated with under developed communities, with limited economic resources, where pigs are raised in

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primitive conditions, moreover, people defecate outdoors and pigs are allowed to roam free and eat faeces (Ngowi *et al*., 2001). Helminths are among the gastrointestinal parasites that are responsible for substantial loss of productivity in swine and other livestock industry. This is due to their deleterious effects on these animals This intestinal parasites cause significant morbidity and mortality throughout the world, as a result of the devastating effect of the disease they cause and have a direct life cycle (Oluwafemi, 2008).

The parasites cause losses from condemnation of carcasses and restriction of exports (Grindle, 1978), causing wide spread economic losses to the pig industry (Acevedo, 1982). In Africa, a very conservative economic estimate indicate that the annual losses due to porcine cysticercosis in 10 west and central African countries amount to about 25 million euro (Zoli *et al*., 2003). The prevalence of cysticercosis (20.5%), in some regions of Nigeria were very high (Onah and Chienjina, 1995) and accounted for 66.7% carcass condemnation in swine (Antia and Alonge, 1982) in an abattoir.

Although, the conditions in Nigeria appear favourable for transmission of these parasites, paucity of data exist on the prevalence of infection caused by this parasites in pigs in Nigeria, it becomes necessary therefore that surveys be carried out, to ascertain the prevalence of these parasites, so that more efforts can be geared towards the control and prevention of these diseases in pigs.

This study was undertaken to determine the prevalence of cysticercosis and intestinal parasitism among pigs in Jos Metropolis North-central Nigeria.

MATERIALS AND METHODS

The study area: Plateau State covers an area of 58,630 km. The state is sharply divided by the geographical feature that gives its name, the Jos Plateau. It is granite up thrust rising some 1000 m above the surrounding plains. The vegetation of the lowlands of Plateau State is sub-humid in the savannah. The state records a total of 535,315 pigs being reared out of which 528,750 are from the villages, while, 6,596 are in the urban areas.

Study population: Households keeping pigs in 9 locations in Jos metropolis including Abattoir, Apata, Angwan Rukuba, Chwelgyep, Tudun wada, wild life, trade center and Vom were visited randomly (between June 2006-April 2007) until the required number of pigs (115) was obtained. Swine older than 3 months of age, non pregnant, non-lactating and not bred recently were selected. Each pig was identified by house number, along with a sequential number depending on the number of pigs per household.

Serology: On visiting a household where the farmer kept pigs, (Apata 25, Abattoir 23, Angwan Rukuba 15) the eligible pig was restrained on its lateral recumbence and the head was stabilized by the use of a pig snare. About 5 mL of blood was collected from the ear vein of the pigs in the various locations and sera prepared from these. Samples were frozen at 20°C for serodiagnosis. A total of 63 pigs were examined serologically for the qualitative screening of serum IgG antibodies to *Teania solium* using Enzyme Linked Immunosorbent Assay (ELISA, Diagnostic Automation, INC. Calabasas) as described by Dorny *et al*. (2000).

- Interpretation of Results-ELISA Reader
- Zero ELISA reader on air. All wells were read at 450/650-620 nm

Detection of intestinal parasites in pigs: One hundred and fifteen stool samples were collected from pigs in the various locations, Abattoir 20, Chwelgyep 20, trade centre 10, Tudun wada 15, wildlife 35 and vom 15, respectively. Feacal samples were collected in plastic wide mouthed containers with tight fitting covers. About 5 g of faeces was collected directly from the rectum of each animal with the aid of gloves. The feacal samples were collected from the eligible pigs on spot by lubricating the anal region with soap and introducing the index finger and scooping out the feaces. The samples were taken to the laboratory within few hours of collection for processing to ensure that the morphological features of the parasite remain intact. Formal saline was added to preserve samples that could not be identified immediately. Formol-ether Sedimentation Technique was used for examination procedure for faecal sample. As in the direct wet smear, iodine was added to enhance morphological detail.

Statistical analysis: Data were entered into computer and analysed using Epi-INFO version 6 computer soft ware programmes. Chi square (χ^2) was used to test for association between variables. All the data were recorded and the prevalence was computed in percentages. Tables were formed by taking into cognisance the aim and objectives of the study.

RESULTS AND DISCUSSION

Twenty nine pigs were positive for cyticercosis giving a seroprevalence rate of 46.0%. While, 107 pigs were positive for intestinal parasitism giving a prevalence rate of 86.9%.

Table 1: Prevalence of cysticercosis in the sampled swine in jos metropolis in relation to locations and gender

Location	No. examined	No. (%) positive	No. males examined	No. males positive	No. females examined	No. (%) females positive
Apata	25	11 (44.0)	8	4 (50.0)	17	7 (41.1)
Abattoir	23	12 (52.1)	9	5 (55.5)	14	7 (50.0)
Anguwan rukuba	15	6 (40.0)	5	1 (20.0)	10	5 (50.0)
Total	63	29 (46.0)	22	10 (45.5)	(41)	19 (46.3)

Location: $X^2 = 2.1309$; $p>0.05$, Gender: $X^2 = 2.7932$; $p>0.05$

Table 1 shows that 29 out of 63 pigs (46.0%) in the study area were positive for cysticercosis. Of this number, 10 out of 22 males (45.5%) and 19 out of 41 (46.3%) female pigs were positive for cysticercosis. The highest seroprevalence of cysticercosis came from Abbatoir, in which, 23 pigs were examined, 12 (52.1%) were positive for cysticercosis, of which 5 out of 9 males (55.5%) and 7 out of 14 females (50.0%) were positive for cysticercosis. While, in Apata, 25 pigs were examined, 11 (44.0%) were positive for cysticercosis, of which 4 out of 8 males (50.0%) and 7 out of 17 females (41.1%) were positive for cysticercosis. However, in Angwan rukuba, 15 pigs were examined, 6 (40.0%) were positive for cysticercosis, of which 1 out of 5 males (20.0%) and 5 out of 10 females (50.0%) were positive for cysticercosis.

The prevalence of intestinal parasitism in the sampled swine in Jos metropolis is shown on Table 2. Out of the total 115 pigs examined, in Jos metropolis 107 (93.0%) were positive for intestinal parasitism, out of which 33 of 35 (94.2%) pigs from wild life area had one parasite cyst or ova and 15 out of 15 (100%) pigs from Tudun Wada had intestinal parasitism. In Abattoir area, 17 out of 20 (85.0%) pigs examined were positive for intestinal parastitism, while, in Vom 14 out of 15 (93.3%) pigs examined had intestinal parasitism. In Trade centre and chewlgyep 10 out of 10 (100%) and 18 out of 20 (90%) of the pigs examined had intestinal parasitism.

The distribution of the individual intestinal parasites Is shown on Table 3. Out of the 115 faecal samples collected from the pigs in the study area, 6 types of intestinal parasites were identified. The result shows that 9 (7.8%) *strongyloides* sp. 53 (46.0%) *oesophagostomum*, sp., 11 (9.5%) *Oesophagostomum/Ascaris suum,* 5 (4.3%) *Ascaris suum,* 18 (15.6%) *Eimeria* sp., 3 (2.6%) *Dicrocoelium* sp. and 1 (0.8%) *Trichuris suis* sp. were present in the sampled pigs.

The seroprevalence of porcine cysticercosis in the study (46.0%) is high and not comparable to studies done in some other regions of the country, for example in the East, Onah and Cheijina (1995) obtained 20%, in the west Anong and Dipeolu (1983) and Faleke and Ogundipe (2003) obtained zero (0%) and 0.32%, respectively while, in Northern Nigeria, Dada (1980) obtained 0.33%. However, it agrees with that obtained in some regions (Dshang) of cameron (39.8%) by Zoli *et al.* (2003). This

Table 2: Prevalence of intestinal parasitism in the pigs in the sampled areas in jos metropolis

Location	No. examined	No. positive	Positive (%)
Wild life	35	33	94.2
Abattoir	20	17	85.0
Vom	15	14	93.3
Tudun wada	15	15	100.0
Trade centre	10	10	100.0
Chwelyep	20	18	90.0
Total	115	107	93.0

$X^2 = 17.6876$; $p<0.05$

Table 3: Prevalence of individual intestinal parasitism in the sampled pig in jos metropolis (n = 115)

Parasite	No. positive	Positive (%)
Strongyloides sp.	9	7.8
Oesophagostomum sp.	53	46.0
Oesophagostomum/Ascaris suum	11	9.5
Ascaris suum	5	4.3
Emeria sp.	18	15.6
Dicrocoelium sp.	3	2.6
Trichuris suis	1	0.8
Total	100	86.9

$X^2<101.878$, df = 6, $p<0.0001$

result also agrees with reports of Garcia *et al.* (1999) and The Cysticercosis Working Group in Peru (1993), where results indicate that the rates of porcine infection varies, but in endemic region, 30-60% pigs are seropositive. The high seroprevalence obtained in this study might be because the ELISA Test was used in this study. The ELISA test is sensitive and specific, although it only indicates that the subject being tested has had previous exposure or infection by the parasite and does not necessarily have a current viable infection (Willingham, 2002). However, previous works in the country (Anong and Dipeolu, 1983; Dada, 1980; Faleke and Ogundipe, 2003; Onah and Cheijina, 1995) had been based on lingual examination and post mortem findings. The lingual examination technique is not very sensitive; it detects only 50-70% positive cases. While, post mortemanatomopathological examination will usually not detect pigs infected with light infection (Pinto *et al.*, 2000; Willingham, 2002). The study did not find any significant relationship $p>0.05$ with gender and location in the sampled swine which is similar to that obtained by Onah and Chienjina (1995), where they indicated that sex of pigs had no significant effect on occurrence of cysticercosis in the sampled swine. Indicating the same conditions favourable for transmission and maintenance of the infection exist in all the gender and location.

Out of the 115 stool samples examined from the pigs, (93.0%) 107 were found with at least one parasite cyst or ova. There was a statistical significance in relation to the various location $p<0.05$. Tudun wada and Trade center had the highest prevalence of 100% while, the lowest prevalence of 85.0% which is still high came from abattoir. This is because of the low level of hygiene, in the respective locations.

There was a high statistical significance in relation to the individual parasites ($p<0.05$). The different rates of intestinal parasites encountered, were *Oesophagostomum* (46.0%), which is higher than that obtained in Jos previously (35.16%) and lower than that obtained in Port Harcourt 50.0% by Salifu *et al.* (1990). The prevalence of *Eimeiria* sp. (15.6%) is also, higher than that obtained by the same authors 2.4% in Jos 3.6% in port Harcourt. However *Strongyliodes* sp. had a low prevalence of (7.8%), which is lower than that obtained previously in the state (87.7%) by the same author. However, the prevalence of *Ascaris suum* in our study (9.5%) in mixed and single infection (4.3%) was lower than that obtained previously (53.1%), (10.4%) in port Harcourt by Salifu *et al.* (1990) and lower than that obtained (45.26%) by Talabi *et al.* (2007) in Ogun state. The prevalence of *Trichuris suis* in our study is very low (0.8%) compared to that obtained by Salifu *et al.* (1990) (8.5%) in Jos and port Harcourt (47.2%).

CONCLUSION

The study has shown a very high seroprevalence of cysticercosis and intestinal parasitism among pigs in Jos metropolis, indicating that *T. solium* cysticercosis (zoonoses) and intestinal parasitism are important although under recognized problem among pigs in Jos metropolis. It also showed that the parasites observed in the study abound in Nigerian pigs and there presence are influenced by hygiene and therefore, are also a major constraint to the swine industry. Similar high prevalence figures might be found in other pig raising regions where surveys have not yet been carried out. Therefore, successful Epidemiological surveillance and control programmes need to be conducted on this important zoonoses and other intestinal parasites in different parts of the country where pigs are reared and consumed and the local laboratory need to be also improved if the diagnosis and treatment of infections are to be effective. Treatment of pigs with drugs like oxfendazole would be very helpful as part of mass cysticercosis control programmes.

LIMITATION

The performance rates obtained for serological test for the diagnosis of cysticercosis have shown wide variability because of cross reactions with *echinococcus* infection, which can only be confirmed by immumoblot offered by the CDC.

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