

PORCINE CYSTICERCOSIS IN PIGS SLAUGHTERED IN JOS MUNICIPAL ABATTOIR AND LANTANG NORTH LOCAL GOVERNMENT AREA, MARKET SLAUGHTER SLAB, PLATEAU STATE, NIGERIA

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ABSTRACT

Porcine cysticercosis remains a major public health problem in developing and some developed countries. A cross-sectional abattoir and slaughter slab based study design was carried out to determine the prevalence of cysticerci of *Taenia solium* in slaughtered pigs. A total of 341 pig carcasses at slaughter comprising of 150 from Jos Municipal Abattoir and 191 from Langtang North market slaughter slab were examined using palpation and incision technique of routine meat inspection. Of the 341 slaughtered pigs examined, 26 were infected giving an overall prevalence of 7.6%. The study based on location revealed that the prevalence was higher 21/191(11.0%) in Langtang North Local Government Area than in Jos 5/150(3.3%) (RR=0.3032; P=0.006; 95 % CI= 0.1170 -0.7853). Though not statistically significant, the study showed that the prevalence was higher (9.2%) in females than males (6.5%) (RR=0.7136; 95% CI=0.3411-1.493; df=1; P=0.4110). The carcasses harbored a total number of 165 cysts which were identified and removed from infected animals. Out of this number, the shoulder muscle harbored the highest proportion 57(34.5%), followed by the masseters 49(29.7%), the tongue 36(21.2%) and the heart 23(13.5%). All cyst examined were immature and viable. This study has confirmed the presence of *Cysticercus cellulosae* in pigs slaughtered for human consumption in the regions of Plateau State, Nigeria posing public health threat in the study area.

Keywords: Porcine, Cysticercosis, Palpation, Incision, Cysticercose Cellulosae

INTRODUCTION

Porcine cysticercosis is a tissue infection caused by the young form of pork tapeworm *Taenia solium*. It is an emerging parasitic disease of animals and humans (Waiswa *et al.*, 2009). The domestic pig (*Sus scrofa domestica*) is the intermediate host while man is the definitive host (Cox, 2002). Infection in pigs is acquired by the ingestion of *T. solium* eggs in food or water contaminated with infected human excreta and then harbors *Cysticercus cellulosae* the larval stage of the parasite. Humans acquire infection through consumption of raw or undercooked pork of which account for 44.0% of the world meat protein consumption (Githigia *et al.*, 2006).

Nigeria has a total of about 3.5 x 10⁶ pigs (Boum *et al.*, 1994) and

this represents 4% of the total domestic livestock. Pigs have a unique ability to adapt and survive where they are found and are potential protein deficit gap-filler, investment alternative, and source of income among the human population especially women (Ajala *et al.*, 2007; Ajala *et al.*, 2006). Cysticercosis has however been reported to be a limiting factor and a major problem of porcine husbandry in areas where pigs are raised especially in developing countries of Latin America, Africa and Asia (Sarti *et al.*, 1992). There has been the report of financial losses due to the condemnation of carcasses infected with cysticercosis (Zoli *et al.*, 2003; Ito *et al.*, 2004). More so, Over 10 million people are reported to be exposed to the larval stage of *Taenia solium* which frequently causes neurocysticercosis and epileptic seizures among those affected (White, 2000).

Pigs raised and managed in poor sanitary condition may play an important role in the perpetuation of the parasite lifecycle and so pose a health threat to humans. At present, pigs in this part of the country are raised mostly under extensive or semi-extensive management system which may predispose them to some parasites of zoonotic importance as they scavenge. Studies have shown that *T. solium* infection has been associated with poverty, the absence of latrine and access by scavenging pigs to human faeces (Diaz *et al.*, 1992; Schantz *et al.*, 1993; Sarti *et al.*, 1997). Cysticercosis/neurocysticercosis the infection caused by the larval stage of zoonotic pork tapeworm *T. solium*, is considered to be the most important parasitic infection of central nervous system in humans in disease-endemic zones (Prasad *et al.*, 2008; Foyacasibat *et al.*, 2009; DeGiorgio *et al.*, 2005; Garcia, 2004). Information on porcine cysticercosis is scarce in Plateau State, North Central Nigeria. This study therefore, provides useful information towards creating awareness and instituting control programmes against the disease in pigs in order to limit the transmission of infection to humans in the area.

MATERIALS AND METHODS

Study Area

The study was carried out in Jos Abattoir Jos North Local Government Area and slaughter slab in Langtang North Local Government Area Plateau State. Jos is the capital of Plateau State located in the middle belt region of Nigeria. The city is divided into three separate Local Government Areas: Jos South,

Jos North, Jos East with the population density of 1.03 persons per square mile (391 person per kilometer square) (NPC, 2006). It is located at latitude 9°56'N, and longitude 8°53'E high on the Jos Plateau State. The city has an altitude of 4.062 feet above sea level and so enjoys a more temporal climate than most of the rest Nigerian region. The Jos abattoir is located in Jos North Local Government Area. Langtang North lies 194 kilometers south-east of Jos between latitude 9° 08'00"N and longitude 9°47'00"E. It is made up of four districts; Gazum, Langtang, Phil-gani and Dadur. The annual rainfall of the area ranges from 800mm to 900mm. The topography of the area is rich for agriculture and rearing of animals (SCRD, 2011).

Study design, sampling technique and carcass examination for the presence of cyst

An abattoir and slaughter slab cross-sectional study design was carried out. The calculated sample size was 79.86 using the formular described by Thrushfield (1995) and a previous prevalence of 5.5% (Kashima *et al.*, 2013). However, a total of 341 pigs comprising of 150 from Jos Municipal Abattoir and 191 from Langtang North Local Government Area market slaughter slab. Systematic random sampling technique was used in which one out of every two pigs at slaughter in Jos Municipal abattoir and Langtang North market slaughter slab was included for examination. Information on the predilection site of cyst and sex was recorded. Presence or absence of cyst was determined by physical inspection of the tongue, masseter muscle, shoulder muscle and heart. The carcass and organs were examined and visually inspected for the presence of cysts as describe by Anosike (2001). Cysts was recorded as viable based on fluid transparency while non- viable based on visible bluish green caseous masses or necrotic (dark patches) as described by Thornton and Gracey (1976).

Cyst Identification as mature or immature

Cyst samples were transported in 10% formalin in sample bottles to the Parasitology Laboratory National Veterinary Institute Vom for identification as either mature or immature.

Data Analysis

Descriptive statistics (prevalence, frequency, and percentages) was calculated for categorical data. Chi-square test was used to determine the association between the presence of cyst, sex and predilection sites.

RESULTS

A total of 341 slaughtered pigs comprising of 150 from Jos Municipal Abattoir and 191 from Langtang North Local Government Area market slaughter slab were examined using palpation and incision technique of routine meat inspection. Of the 341, 26 were infected giving an overall prevalence of 7.6%. The study based on location revealed that the prevalence was higher 21/191(11.0%) in Langtang North Local Government Area than in Jos 5/150(3.3%) (RR=0.3032; P=0.006; 95 % CI= 0.1170 - 0.7853) (Table 1). Based on sex the study showed that infection was higher (9.2%) in females than males (6.5%). This is however, not statistically significant (RR=0.7136; 95% CI=0.3411-1.493; df=1; P=0.4110) (Table 2).

Table 2: shows the frequency of cyst recovery from organs, viability and form. Out of 165 cysts recovered during the study 57(34.5%) were from the shoulder, 49(29.7%) from the masseter

muscle, 36(21.2%) from the tongue and 23(13.5%) from the heart. The entire cysts identified were immature and viable (Table 3).

Table 1: Prevalence of porcine cysticercosis based on location

Location	Number examined	No. Positive	Prevalence (%)	P-Value	95% CI	Relative Risk
Jos	150	5	3.3			
Langtang North	191	21	11.0	0.006	0.1170-0.7853	0.3032
Total	341	26	7.6			

Table 2: Prevalence of porcine cysticercosis based on sex

Sex	Number examined	No positive	%Prevalence	P value	95% CI	Relative risk
Male	199	13	6.5			
Female	142	13	9.2	0.243	0.3411-1.493	0.2436
Total	341	26	7.6			

Table 3: Distribution of Taenia solium cysts based on organs examined, nature and form

Parameters	Number of cyst collected N=165	Percentage (%)
Predilection sites:		
Shoulder muscle	57	34.5
Masseter muscle	49	29.7
Tongue	36	21.2
Heart	23	13.5
Form:		
Mature	0	0.0
Immature	165	100.0
Viability:		
Viable	165	100.0
Non-viable	0	0.0

DISCUSSION

This study has revealed 7.6% prevalence for porcine cysticercosis in Jos Municipal abattoir and Langtang North Local Government Area market slaughter slab, Plateau State, Nigeria. The prevalence was higher in Langtang North than in Jos, Plateau State. Lower prevalence of 3.2%, 6.3%, and 5.5% have been reported by Bui and Ijudai, 2012, Ikeh and Iweka (2009) and Karshima *et al.*, 2013 respectively in other parts of the country. In a related study in Nay Pyi Taw area, Myanmar, Khaing *et al* (2015) reported a higher prevalence of 23.67%. The difference in the prevalence rates in the different areas within the same state and between different states in the same or different country may not be unconnected with the variation in socio-economic status, sanitary facilities as well as the management practices in the different areas. Infection with *Taenia solium* has been reported to be important in areas with low socio-economic development, poor and inadequate sanitary facilities where pigs run loose scavenging for food and with a ready access to human faecal materials (Soulsby, 1982).

Cysts have been reported to be mostly recovered from the

shoulder muscle, masseter muscle, tongue and heart (Sciuto *et al.*, 1998). This study showed that cysts were common on the shoulder and masseter muscle than the tongue and heart muscle. This finding is similar to that reported by Biu and Ijudai (2012). The study also agrees with the reports of Boa *et al.*(2001) who examined 24 pigs in Tanzania and reported a higher prevalence of cyst in the shoulder muscle (24.5%) and the masseter muscle (8.1%) than either the tongue (7.0%) or the heart (3.6%) muscles. In a study conducted by Khaing *et al.* (2015) in all the infected pigs, cysts were located in the tongue with only one located in the heart.

The prevalence of porcine cysticercosis was 6.5% in males and 9.2% in females. This finding though not statistically significant agrees with the findings of Karshima *et al.* (2013) in Ibi, Taraba state where females had 3.72% higher prevalence than the males (2.54%). Khaing *et al.* (2015) also reported that the gender of pigs was significantly associated with porcine cysticercosis with the female having the higher prevalence. The female pigs are usually kept longer than the males in a herd for breeding purposes and so get exposed to the risk factors and may explain the reason for the high prevalence in the female than in the male.

All carcasses examined in the study were of the indigenous breed. Indigenous pigs are usually left on a free-range because they are normally raised under backyard farming and allowed to scavenge for food. This usually exposed them to human faeces and so predisposes them to infection and eventually serves as a source of infection to humans (Karshima *et al.*, 2013).

The cysts recovered in this study were immature and viable. This agrees with the observation of Soulsby (1982) that though the longevity of cysticerci is not known, the young age at which pigs are slaughtered means that the majority of cysts in pork would be viable, but where caseation or calcification occurs the cysticerci are no longer viable.

Conclusion

This study confirmed an overall prevalence of 7.6% infection rate of *Cysticercus cellulosae* in pigs slaughtered for human consumption in Jos Municipal abattoir and Langtang North Local Government Area market slaughter slab, Plateau State, Nigeria posing public health risk in the study area and could be a useful aid for public health alert. Further studies that will cover other regions of the state should be undertaken. More so, there should be effective routine meat inspection and public awareness campaign on the risk of consumption of undercooked pork.

Authors contributions:

Bata, S. I and Daniel, L conceived and designed, supervised the implementation and contributed in the final write-up of the research work, Gano, Y. J and Zinkat G. J play important role in the field work (carcass examination) with Bata, S. I's guidance. Akaninyene, D. U edited and proof read the manuscript and made significant input also some input from Maimadu, A.A. Bata, S. I carried out the data analysis. All authors have read the final draft of the manuscript.

Conflict of interest

The authors wish to declare that "there is no conflict of interests regarding the publication of this article"

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