



Prevalence and morphometric studies on porcine cysticercosis in Adamawa State, Nigeria

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Abstract

Porcine cysticercosis is emerging as a serious agricultural and public health problem in African countries. A study on the prevalence and morphometric of porcine cysticercosis was conducted at post mortem using palpation and incision technique of routine meat inspection. Out of the 247 slaughter pigs examined at post mortem, 8(3.2%) were infected and of this number 5(2.7%) were males and 3(5.1%) were females. Infection was more common in the Hampshire breed 7(3.5%), than the black Ashanti 1(3.3%). The Landrace breed had no infection. A total of 760 cysts were removed from infected animals. Out of this number, 261(34.3%) were removed from the shoulder muscle, 189 (24.9%) from the masseters, 176 (23.2%) from the tongue and 134 (17.3%) were removed from the heart respectively. 5 (0.65%) of the cyst were matured and 755 (99.34%) were immature. A total of 632 (83.2%) were viable while 128 (16.8%) were non-viable. Cyst morphometry indicated an overall mean \pm SD (range) of $8.8\pm 1.0(5-12)$ by $5.4\pm 1.1(3-7)$ mm. Cysts from the shoulder had a mean \pm SD (range) (length x breadth in mm) of $7.6\pm 8.7(5-11)$ by $4.4\pm 8.8(3-6)$ while those from the masseters were $7.8\pm 6.9(6-12)$ by $4.7 \pm 3.8 (4-6)$, tongue $8.7 \pm 2.9 (6-12)$ by $5.7\pm 2.6(4-6)$, and heart $8.6\pm 3.5(5-12)$ by $5.3\pm 3.7(3-7)$. The mean \pm SD (range) number of hooks counted was $4.4\pm 0.4 (4-6)$. This study has confirmed the presence of *Cysticercus cellulosae* and its morphological characteristics, which are useful aids in providing diagnostic and public health alerts.

Keywords: cysticercosis, morphometry, nigeria, porcine, prevalence.

Introduction

Porcine cysticercosis is an emerging agricultural and public health problem (Waiswa *et al.*, 2009). The domestic pig (*Sus scrofa domesticus*) acts as the normal intermediate host of *Taenia solium* while man the definitive host (Cox 2002; Wadia & Singh, 2002). Pigs harbor *Cysticercus cellulosae*, the larval stage of *T. solium*. Pigs acquire the infection when they ingest *Taenia solium* eggs through the contamination of their food or water with human excreta. Man acquires infection by consuming raw or undercooked pork, which is among the most popular meat consumed in the world accounting for 44% of the world meat protein consumption (Githigia *et al.*, 2006). Nigeria has a total of about 3.5×10^6 pigs (Bourn *et al.*, 1994) and this represents 4% of the total domestic livestock. Pigs have a unique ability to adapt and survive in areas where they are found, and are a potential protein deficit gap-filler, investment alternative and source of additional income among the human populace especially women (Ajala *et al.*, 2006; Ajala *et al.*, 2007).

Cysticercosis is however a limiting factor of porcine husbandary in areas where this animals are raised especially in many developing countries of Latin America, Africa and Asia (Sarti *et al.*, 1992; Geerts *et al.*, 2002; Ikeh & Iweka, 2009). It is also estimated that over 10 million people are exposed to this larval worm which frequently cause neurocysticercosis and epileptic seizures among those affected (White Jr., 2000). There is inadequate information on porcine cysticercosis in the study area where pig husbandary is of free range with poor environmental and personal sanitation. This study was conducted to determine the prevalence and morphological characteristics of *Cysticercus cellulosae*.

Materials and methods

This study was conducted at the pig abattoir in Michika township, Adamawa State, Nigeria. A total of 247 pigs were inspected randomly at post mortem using palpation and incision techniques

during routine meat inspection. The tongue, masseters, heart and diaphragm were palpated and incised and visually inspected for presence of cysts. Cysts were classified as viable based on fluid transparency and visible scolex), dead (bluish green caseous masses) or necrotic (dark patches) as described by Thornton & Gracey (1976). Prevalence of cysts was recorded as percentage based on sex, age and breed of pigs, while the length and breadth of each cyst in millimeters recorded as mean ± standard deviation (SD).

Results

Table 1 shows the prevalence of porcine cysticercosis based on sex, predilection site and breed of pigs. Out of 247 pig carcasses examined 8(3.2%) were infected representing 5(2.7%) in males

and 3(5.1%) in females (p>0.05). The shoulder and masseters muscles were more commonly infected than the tongue or heart muscles. The Hampshire breed had the highest prevalence of 7(3.5%) compared with black Ashanti 1(3.3%) and Landrace 0(0.0%).

Table 2 shows the frequency of cyst recovery from organs, their age and viability. Out of 760 cysts recovered during the study, 261(34.3%) were collected from the shoulders, 189(24.9%) from the masseters, 176(23.2%) from the tongue and 134(17.3%) from the heart. Majority of the cysts were immature and viable.

The morphometry of the cysts collected are presented in Table 3.

Table 1: Prevalence of porcine cysticercosis based on sex, predilection site, breed, and management system

Parameter	Number examined	Number infected (%)
Overall	247	8(3.2)
Sex:		
Male	188	5(2.7)
Female	59	3(5.1)
Predilection site:		
Shoulder muscle	247	3(1.2)
Masseters	247	3(1.2)
Tongue	247	1(0.4)
Heart	247	1(0.4)
Breed:		
Black Ashanti	30	1(3.3)
Haampshire	201	7(3.5)
Landrace	16	0(0.0)

Table 2: Distribution of cysts based on organs examined, nature and form

Parameter	Number (%) of Cysts Collected (n=760)	Mean ± SD (range)
Predilection site:		
Shoulder muscle	261(34.3)	86.7 ±1.5 (72-106)
Masseters	189(24.9)	63 ± 4.8 (42-94)
Tongue	176(23.2)	-
Heart	134(17.3)	-
Form:		
Mature	5(0.65)	2.5±1.3 (1-4)
Immature	755(99.34)	151 ±16.0 (82-176)
Viability		
Viable (alive)	632(83.2)	90.28 ±10.4 (82-150)
Non-viable (dead)	128(16.8)	21.3 ±7.0 (5-42)

Table 3: Cyst Morphometry

Parameter	Mean ± Standard Deviation (range) in mm
Length	8.8±1.0 (5-12)
Breadth	5.4±1.1 (3-7)
Number of hooks	4.4±0.4 (4-6)

Discussion

This study has revealed 3.2% prevalence for porcine cysticercosis in Michika North-eastern Nigeria. Previously, a prevalence of 5.5% was reported in Southern Nigeria by Ikeh & Iweka. (2009) who attributed it to free range method of pig husbandry which facilitates access by pigs to infectious material. Infection with *Taenia solium* is important in areas with low socio-economic development, poor and inadequate sanitary facilities, and where pigs run loose scavenging for food, and with a ready access to human faecal material (Soulsby, 1982).

Cysts were mostly recovered from the shoulder muscles, masseters, tongue and heart which agrees with previous reports (Soulsby, 1982; Sciuotto *et al.*, 1998). As observed in this study, the cysts were most common in the shoulder and masseter muscles than the tongue and heart muscles. This agrees with the reports of Boa *et al.*, (2001) who examined 24 pigs in Tanzania and reported a higher prevalence of cysts in the shoulder muscles (24.5%) and the masseters (8.1%) than either the tongue (7.0%) or heart (3.6%) muscles.

The prevalence of porcine cysticercosis in male pigs was 2.7% and 5.1% in females. This finding though not significant contradicts the findings of Garcia *et al.*, (2003) in Peru where males had higher prevalence (38.1%) than females (34.4%). Also, this study has revealed a higher ($p>0.05$) prevalence of 7(3.5%) in Hampshire pigs than 1(3.3%) in black Ashanti and 0(0%) in Landrace compared with the findings in Mozambique by Pondja *et al.*, (2010) who

observed a prevalence of 12.7% in black Ashanti with no separate record for Hampshire and Landrace. So far there is no clear reason as to variations among sex or breed but infection in pigs is a function of both human contamination of the environment and pig proximity to a human *Taenia solium* carrier (Waiswa *et al.*, 2009).

A mean (range) of 8.8 ± 1.0 mm (5-12) length and 5.4 ± 1.1 mm (3-7) breadth was observed for the mature cysticerci collected which agrees with the findings of Markell *et al.*, (1999) who observed that the length of *Cysticercus cellulosae* was between 6-18mm, but smaller than 20 x 10mm reported by Soulsby (1982) for a fully developed cysticercus. Also a mean of 4.4 ± 0.4 hooks with a range of 4-6 were counted.

A total of 760 cysticerci were recovered from the 247 pigs examined in this study. Soulsby (1982) reported that pigs may acquire massive infection, because the gravid segments of *T. solium*, unlike those of *Taenia saginata* are not active and may remain in and about the faeces resulting into a very high concentration of eggs. The majority of cysts recovered in this study were immature and viable. This agrees with the observations 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.

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