

The Impact of Prevalence of *Taenia Solium* Eggs in Soil And Cysticercosis-Free Pigs In Zuru Local Government Area, Kebbi State, Nigeria

¹*Sallau, I., ²Faleke, O.O., Junaidu, A.U., Lawal, M.D³ and Shehu, Z.⁴

¹Ministry of Animal Health and Livestock Development, Kebbi, Kebbi state, Nigeria

²Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Usmanu Danfodiyo University Sokoto, Nigeria

³Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, Usmanu Danfodiyo University Sokoto, Nigeria

⁴Department of Veterinary Medicine, Faculty of Veterinary Medicine, Usmanu Danfodiyo University Sokoto, Nigeria.

Corresponding Author's Email: shehu.zaid@udusok.edu.ng

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ABSTRACT

This study assessed the prevalence of *Taenia solium* cysts in pigs and the presence of *T. solium* eggs in soil from freely roaming pigs in the Zuru district of Kebbi State, Nigeria. A total of 50 soil samples were collected from selected areas and examined for taeniid eggs using centrifugation and sedimentation techniques, while 24 pigs were inspected for cysticercosis following standard meat inspection procedures. No porcine cysticercosis was detected, as all pigs were free of cysts at the antemortem inspection. However, taeniid eggs were identified in 13 of the 50 soil samples (26%), suggesting potential environmental contamination that could pose a risk to both human and animal health. The presence of *T. solium* eggs in the soil indicates possible contamination from human feces and highlights the risk of infection and re-infection in pigs scavenging in these areas. This finding underscores the potential health hazard to pork consumers. The study recommends implementing strict control measures to reduce the transmission of *T. solium* in the region.

Keywords: *Taenia solium*, cysticercosis, pigs, slaughter, soil, Zuru, Nigeria.

1.0 INTRODUCTION

Porcine cysticercosis is an infection caused by the larval stage of the zoonotic tapeworm *Taenia solium*, which can spread from humans to pigs. Different stages of the life cycle of the same parasite, *Taenia solium*, also known as the pig tapeworm, produce cysticercosis and taeniosis, two significant but often ignored parasitic zoonotic illnesses (Arora and Arora, 2012). Pigs serve as the parasite's typical intermediate hosts during these stages of its life cycle, and humans are the only definitive hosts, harbouring the adult tapeworm that causes taeniosis. Taeniosis is a disease that primarily affects impoverished rural communities in developing nations in Latin America, sub-Saharan Africa, and Asia where pigs are raised without restriction and pork is consumed with poor hygiene standards. By consuming *T. solium* eggs excreted in the faeces of people suffering from taeniosis, humans and pigs can contract cysticercosis (O'neal *et al.*, 2012). When humans or pigs ingest the eggs, larval worms are formed. These worms travel through the circulatory system to various regions of the human or pig's body, where they encyst in internal organs and cause cysticercosis.

One of the main human migration sites is the central nervous system (CNS). This can lead to a condition

called human neurocysticercosis (NCC), which is characterised by neurologic dysfunctions like seizures brought on by brain cysts, excruciating headaches, hydrocephalus, and the incapacitation of the afflicted individual (Pawlowski *et al.*, 2005).

About 30% of all instances of acquired epilepsy in endemic areas are caused by neurocysticercosis, which is thought to be the most significant parasite disease affecting the neurological system (Ndimubanzi *et al.*, 2010).

Both humans and pigs are susceptible to *Taenia solium* cysticercosis, which is a substantial yet underappreciated public health issue (Tsang *et al.*, 1995). Because contaminated pork is stigmatized, the disease results in significant financial losses (Pawlowski *et al.*, 2005). It is evident from the life cycle that a person with taeniosis excretes both the infectious eggs and faeces. Pigs are the primary intermediate hosts for the development of cysticerci, which are developed after ingesting infectious *T. solium* eggs from the environment. Pigs become infected when they feed on the excrement of an infected person. Therefore, factors that facilitate pigs' access to excrement are crucial to the transmission cycle. Such conditions include poor sanitation, indiscriminate

disposal of faeces in the external environment, free-range pig keeping or backyard pig keeping, and direct feeding of pigs with human faeces (Garcia *et al.*, 2003).

Numerous research studies have been conducted on the prevalence of swine cysticercosis globally, as well as in some regions of Africa, Asia, India, and Latin America. According to reports, up to 20.5% of pigs in Nigeria may have cysticercosis (Onah and Chiejina, 1995). Given that there are 37 epileptics for every 1000 people in Nigeria, it is expected that there is human cysticercosis (Onah and Chiejina, 1995).

There is a lack of information on *Taenia solium* cysticercosis in many pig-rearing regions of Nigeria. In the study area, the last report on porcine cysticercosis was over ten years ago.

Meat inspection is limited and primarily relies on conventional antemortem/postmortem examination, which often misses viable cysts. Serology is recommended for better detection of viable cysts.

Globally, *T. solium* cysticercosis affects around 50 million people annually, leading to about 50,000 deaths, with neurocysticercosis being the most severe form. It is a major cause of epilepsy and neurological admissions in endemic regions.

The disease is now a growing problem in sub-Saharan Africa and Asia. In Nigeria, inadequate meat inspection increases the risk of exposure to zoonotic parasites, requiring urgent intervention to prevent further public health issues.

Thus, this study attempted to determine the prevalence of *Taenia solium* cysts in pigs using routine meat inspection procedure in the study area and to find the presence (if any) of *T. solium* eggs in soils from where humans defecate openly and pigs roam freely in the study area.

2.0 MATERIALS AND METHOD

2.1 Study area

The study was conducted in Zuru local government area in Kebbi state, North-western Nigeria. It is also the headquarters of Zuru emirate and is located on the following geographical coordinates: Latitude: 11° 26' 6.79" N Longitude: 5° 14' 5.78" E.

The majority of the population live in rural areas and a significant number of urban dwellers engage in farming to supplement their other sources of income. Next to crop farming is animal rearing which includes backyard rearing of pigs in some households (Yatswako *et al.*, 2007).



Figure 1: Map of Kebbi state showing the study area

Source: <https://naijadetails.com/list-of-lgas-in-kebbi-state-and-chairman/>

2.2 Study Design

Cross-sectional study and convenience non-probability sampling techniques were used in the 8 sampling locations of the study areas. All the pigs presented for slaughter per day during the period of the survey were examined at ante-mortem and post-mortem respectively.

2.3 Antemortem Inspection, Postmortem Inspection and Viability Testing

During antemortem inspection, pigs were restrained and the tongue palpated for cysticerci, with age and sex determined by teeth eruption and external genital examination. For postmortem inspection, carcasses were examined over 12 weeks by visualizing and palpating organs like the masseter muscle, tongue, heart, liver, lungs, diaphragm, and kidney for *Cysticercus cellulosae* cysts. Detailed incisions were made in key muscles and organs to detect cysts. Suspected cysts were excised and

taken to a laboratory for viability testing, with live cysts identified as fluid-filled, translucent, and containing visible scolices.

2.4 Soil Sample Collection

Fifty soil samples were collected from the 6 locations in the environment where humans defecate openly pigs roam freely in the study area were analysis (Diaz *et al.*, 1992). Soil samples were collected at 2 meters apart within and around dump sites in 10ml bottles. The soil samples were placed in an ice box and transported to the laboratory of Veterinary Parasitology and Entomology, Usmanu Danfodiyo University, Sokoto for examination. The soil samples were analyzed using simple centrifugation and sedimentation techniques and taeniid eggs were microscopically identified based on their morphological characteristics as described by Mahmuda *et al.* (2014).



Taeniid eggs

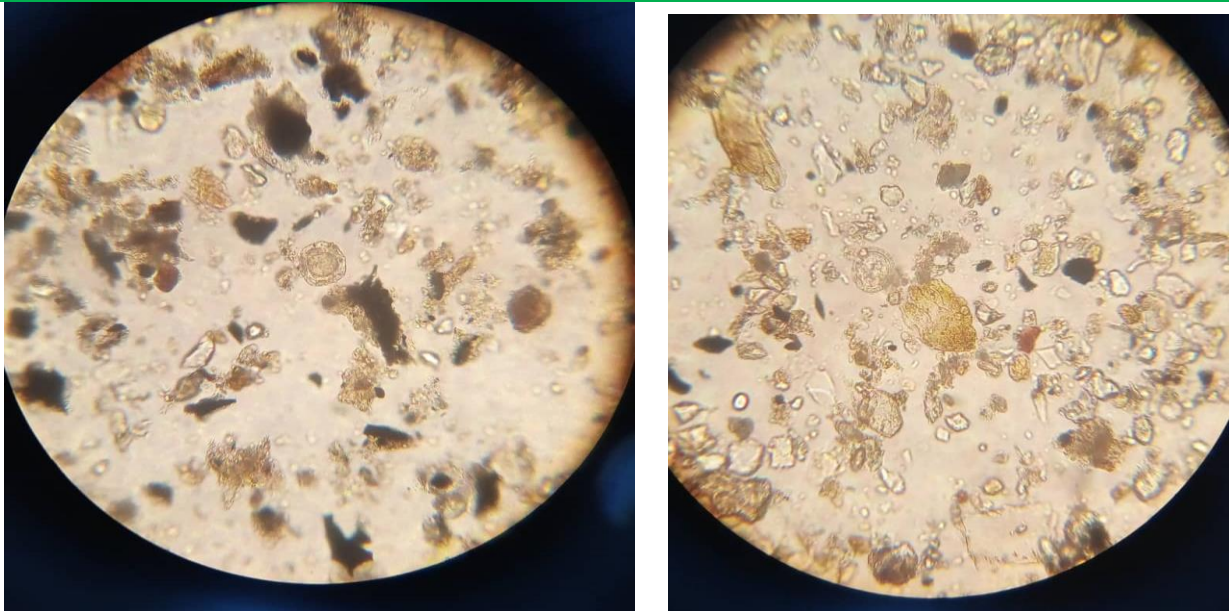


Figure 2: Microscopy of taenid eggs at X40

2.5 Data analysis

A chi-square test was performed to assess the association between prevalence and some risk factors (sex and age) using SPSS version 20. In all analyses, a confidence level of 95% was adopted and values of $P < 0.05$ were considered significant

3.0 RESULTS

A total of 24 pigs were slaughtered during the 12-week period and most of which were young pigs, meat inspection was carried out as described by Faleke and Ogundipe, (2003); Kyvsgaard and Murrell, 2005 but no cysts were found in all the predilection sites inspected at both antemortem and postmortem, signifying a 0% prevalence.

Out of a total number of 50 soil samples collected from the study area, 13(26%) were positive for taeniid eggs across the study locations. Amanawa /Barracks area had the highest prevalence of Taenid eggs (50%) while Dabai area had the least with an 11.1% prevalence. No significant statistical association was found between the prevalence of Taenid eggs and the location of the samples in the study as shown in Table 1.

Table 1: Distribution of Taeniid Eggs in Zuru L.G.A Based on Location

Location	No. Sampled	Prevalence (%)	χ^2	<i>p</i> value
Tudun wada	8	(12.5)	5.946	0.312
Anguwar zuru	11	(36.4)		
Jankasa	6	(16.7)		
Amanawa barrack	10	(50)		
Twin quarters	6	(16.7)		
Dabai	9	(11.2)		
Total	50	26%		

4.0 DISCUSSION

Humans and pigs can contract porcine cysticercosis, a zoonotic infection brought on by the larval stage of *Taenia solium*. Two significant but frequently disregarded parasitic zoonotic illnesses, cysticercosis and taeniosis, are caused by the life cycle of *T. solium* and arise at distinct phases of the parasite's existence (Arora

and Arora, 2012). According to Pawlowski *et al.* (2005), one of the most severe forms of cysticercosis in humans is called neurocysticercosis (NCC), in which the larvae move to the central nervous system (CNS) and cause neurological dysfunctions such as seizures, excruciating headaches, hydrocephalus, and incapacitation. Due to its role in the development of epilepsy and other

neurological disorders, especially in endemic and low-income areas, the worldwide burden of NCC has been acknowledged. In Nigeria, the status of *T. solium* infections, particularly cysticercosis, is poorly understood, with few recent studies investigating the prevalence of the disease. The most recent major study, conducted by Gweba *et al.* (2010), reported a prevalence of 14.4%, highlighting a significant disease burden. However, this study identified a 0% prevalence based on participatory meat inspection. This outcome could be attributed to the low number of pigs presented for slaughter at the slab per day and the common practice of home slaughter, where meat inspections are not performed. This is consistent with earlier research by Munde *et al.* (1999), who also noted that *T. solium* cysts were not present at Mumbai's Deonar Abattoir. Comparably, Bhadrige *et al.* (2013) found that the prevalence was 0% in India, highlighting the limits of using meat inspection as the only diagnostic method, particularly in situations where thorough inspection is not ensured by slaughtering procedures.

The study period, which followed major festive seasons such as Christmas and Easter, likely affected the results, as pig slaughtering activity tends to peak during these times. Many pigs from Zuru are sold to traders who transport them to southern Nigeria, further reducing the local sample size for inspection. In addition, most pigs slaughtered were younger than 12 months, and home slaughtering remains prevalent in the area. These variables signify the challenges in accurately assessing cysticercosis prevalence based on meat inspection alone.

This study demonstrated a high prevalence of taeniid eggs (26%) in soil samples around Zuru metropolis. This figure is significantly higher than reports from other African countries, such as Tanzania where Kabululu *et al.* (2020) reported a prevalence of 9.2%. The soil sample prevalence from Zuru (26%) also exceeds that of Gweba *et al.* (2010) in Nigeria, where a prevalence of 14.4% was documented. This high prevalence in soil samples may suggest a higher environmental contamination rate in Zuru, which could be linked to improper sanitation practices such as open defecation, a known factor in spreading *T. solium* eggs (Lightowlers *et al.*, 2015).

5.0 CONCLUSION

It can be concluded from the findings in the study that while no porcine cysticercosis was detected in the pigs inspected through standard meat inspection procedures, there is evidence of environmental contamination with *Taenia solium* eggs. The identification of taeniid eggs in the soil samples collected from areas where humans

defecate openly and pigs roam freely indicates a potential risk for both human and animal health.

It was recommended that further research, particularly during high-slaughter periods, will be essential to better assess the true prevalence of *T. solium* in both pigs and humans in the region and strict control measures to mitigate the transmission of *T. solium* in the region should be considered.

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