

## Canine Echinococcosis in Hunting and Companion Dogs in Oyo State, Nigeria: The Public Health Significance

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**Abstract:** Canine echinococcosis is a parasitic cestode infection of public health importance. The present study was carried out to determine the seroprevalence of canine echinococcosis in both rural hunting and urban companion dogs in Oyo State, Nigeria. One hundred and fifty five (155) canine sera were tested for the presence of Echinococcus antigen using the direct enzyme linked immunosorbent assay (ELISA). Dogs sampled were grouped into young (< 1 year) and adult ( $\geq$  1 year). The sex of each dog was also considered. Total prevalence recorded was 9.68% (15/155). There was statistical significant difference ( $p < 0.05$ ) between sera of hunting (15.73%) and companion dogs (1.52%). Prevalence in adult was 12.40% while there was 0.00% prevalence in the young dogs sampled and this was found to be significant. There was no association between sex and prevalence of canine echinococcosis. The result of the study confirms current infection of canine echinococcosis in the state and the need to put workable control measures in place so as to prevent a public health disaster.

**Key words:** Canine Echinococcosis • Hunting dogs • Companion dogs • Prevalence • ELISA • Oyo State

### INTRODUCTION

Canine echinococcosis is a parasitic zoonosis of public health importance causing cystic hydatid diseases in humans [1]. Cystic echinococcosis/cystic hydatid diseases (CHD) is caused by ingesting the eggs of the dog tapeworm *Echinococcus granulosus* (*E. granulosus*) which is cosmopolitan and distributed worldwide in both humans and ungulates [2]. The parasite's domestic life cycle is maintained through dogs, which harbour the adult tapeworm and are the definitive host while a range of domestic livestock intermediate host species exist and humans serve as the accidental/aberrant hosts. Feeding dogs with raw viscera of infected animals contributes to perpetuating this cycle [3]. Infected dogs excrete large number of parasite's eggs with their faeces, contaminating the environment thus spreading the disease [4]. Infection in human is characterised by the development of cystic lesions, principally in liver and lungs, after several years [5]. There is also a resultant economic loss in the meat industry due to the

condemnation of infected organs in food animals [6]. Cystic echinococcosis may initially be asymptomatic sometimes for several years having small (<5 cm) well-encapsulated cysts located in organ sites, where they do not induce major pathology and may remain asymptomatic for many years [7, 8]. The infection becomes symptomatic if cysts exert pressure on adjacent tissue resulting in spontaneous or traumatic cyst rupture which may lead to death in fatal cases [9].

Immunological methods such as ELISA and Dot-blotting are highly accurate and reliable techniques for serodiagnostic purposes although accuracy is largely dependent on the quality of antigenic source used [10] and both ELISA to detect coproantigen as well as serum antibody assays and Dot-blotting techniques have been used to detect echinococcosis [11-13]. Sandwich ELISA was reported to be highly sensitive and specific [11], while relatively low positive predictive value was reported for coproantigen ELISA [12] in contrast with other results of high sensitivity and specificity of the same technique [13]. Coproantigen ELISA and copro PCR technique

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cannot be considered a gold standard [14], however, the most important advantage of coproantigen ELISA over conventional serum antibody assay is that it shows current infection although coproantigens disappear within 2-5 days after elimination of *Echinococcus* worms [12].

Because of its importance in the transmission dynamics of cystic echinococcosis, detection of *E. granulosus* in the canine definitive host is key to developing control programmes [15]. In Nigeria, dogs are kept for various purposes such as hunting, sporting, tending flocks and herds, crime detection and prevention, leading the blind and as a source of protein in some communities. The breeding and selling of dogs bring income to families engaged in such practices [16]. In the urban areas, the exotic imported dogs are more predominant as pets and guard dogs while in the rural communities, the local mongrels are predominant primarily for hunting as most of the rural dwellers are either farmers or hunters or both. Bada [17] was the first to make an attempt at estimating the prevalence of canine echinococcosis in the country and this was done around the Bauchi Plateau zone in the Northern part of the country. The last attempt at evaluating its prevalence in the southwestern part of the country was in 1982 by Anyanwale *et al.* [18] who surveyed slaughtered animals at the abattoir.

The aim of this study is to estimate the prevalence of canine echinococcosis in Oyo State Nigeria so as to estimate the risk posed to human health and also compare the disease in companion dogs found in the urban areas

and the rural hunting dogs of the state. In view of the fact that human hydatid disease impacts on health not only in terms of mortality but also morbidity [19] and because it is not only one of the most widespread parasitic diseases, but also one of the most costly to treat and prevent in terms of public health [1].

## MATERIALS AND METHODS

**Study Area:** The survey was carried out in hunting communities in Oyo State which is in south western Nigeria (Fig. 1). A total of 7 local government (LG) areas (Egbeda, L.G., Iddo, L.G., Ona-ara, L.G., Oluyole, L.G. Akinyele, L.G., Oluyole, L.G. and Ibadan-north L.G.) were involved in the study. The choice of these locations were based on accessibility as there were limitations due to the fact that most rural dwellers in the state are superstitious and convincing them to have blood samples taken from their dogs was difficult; there were some who refused out rightly. Companion dogs used for the study were from the Veterinary teaching Hospital of the University of Ibadan and the State Veterinary Hospital in Ibadan, Oyo State both of which are referral Veterinary Hospitals.

**Sample Collection and Dog's Demographic Information:** Demographic factors considered during sampling include age (young: < 1 year, adult: ≥ 1 year), sex (male or female), purpose of dog keeping (hunting or companion) and location (rural or urban). Samples were collected between December 2012 and April 2013. Blood (3ml) was collected



Fig. 1: Map of Nigeria Showing the Study Location-Oyo State

via the cephalic vein of each dog into plain bottles without anticoagulant, this was allowed to clot by sitting it undisturbed on the laboratory bench for 30 minutes then centrifuged at 1500 revolution per minute for 10 minutes and the separated sera were put in micro centrifuge tubes and stored at -20° C until needed [20, 21].

**Serological Analysis:** The prevalence of canine echinococcosis was determined using direct enzyme linked immunosorbent assay (ELISA) technique to detect Echinococcosis (*E. granulosus*) antigen in dog serum. A commercial kit from Shenzhen Lvshiyuan Biotechnology Co., Ltd China (Green spring canine echinococcosis ELISA antigen kit) was used and tests carried out according to manufacturer's protocol.

**Statistical Analysis:** Statistical analysis was done using Graph pad prism (version 5) with a p-value of <0.05 as statistically significant. Fisher's exact test was used to examine the relationship between sex, age, dog use (hunting or companion) and prevalence of canine Echinococcosis.

## RESULTS

**Demographic Information:** A total of 155 dogs were used for the study (89 rural hunting and 66 urban companion dogs). In all there were 74 females (67 adults, 7 young) and 81 males (54 adults, 27 young). Of the 89 rural hunting dogs, 56.18% were females while 36.36% of the 66 urban companion dogs were females.

**Serological Evaluation:** Total seroprevalence rate was 9.68% (15/155). Of the 89 hunting dogs sampled, 15.73% (14/89) were found to be sero-positive while 1.52% (1/66) companion dogs was sero-positive showing a

statistical significant difference in prevalence ( $p < 0.05$ ). Of the 34 young dogs sampled, none was found to be sero-positive, while 15 of the 121 adult dogs sampled were sero-positive, showing a statistical significant difference ( $p < 0.05$ ) between the two groups. No significant difference was observed between the sexes, ( $p > 0.05$ ), 8.11% in female and 11.11% in male.

## DISCUSSION

This study found a prevalence rate of 9.68% for canine echinococcosis in Oyo State Nigeria. The result is on the high side hence of public health concern because dogs are the major source of infection to man and other animals [5]. For the purpose of this study, the direct enzyme linked immunosorbent assay (ELISA) technique was used to detect *Echinococcus* antigen in dog serum. The most reliable method for diagnosis of *Echinococcus spp.* in definitive hosts is by necropsy, because worm burdens can be accurately estimated and parasites collected for identification [21], this method however have several shortcomings one of which is its ethical justification which serves as major limitation to its use. Thus the use of serological methods for the diagnosis of canine echinococcosis has been recommended over the traditional arecoline purge [1]. Detection of coproantigen of *Echinococcus spp.* in dogs has shown great improvement in diagnosis [22] and the detection of serum antigen used in this study provides a complementary method for diagnostic and surveillance purposes with the high probability of detecting ongoing infection without the cumbersome nature of having to collect, transport and store faecal samples.

A statistical significant difference was recorded between prevalence in rural hunting dogs versus the urban companion dogs. Companion dogs have better access to veterinary care and are less likely to be fed raw visceral, on the other hand, rural hunting dogs most likely have greater access to infected offal or casualty animals [23, 24] in the bush. This is because apart from reports of infection in domestic ungulates, there have also been reports in wild ungulates, particularly bovis, as well as primates, leporids and macro-pod marsupials [25, 26]. Hunters that participated in the survey confirmed that the dogs were fed raw offal from successful hunting trips.

None of the young dogs sampled were sero positive while the 12.40% recorded for adult dogs was statistically significant. Although it is assumed that there should be a lower worm burden in adult host compared to the younger host who have not yet acquired any immunity

Table 1: Sero-prevalence of canine echinococcosis between use, sex and age group of dogs sampled

Category	Number infected/No examined	Prevalence(%)
USE		
Hunting	14/89	15.73*
Companion	1/66	1.52*
SEX		
Female	6/74	8.11
Male	9/81	11.11
AGE		
Young	0/34	0.00*
Adult	15/121	12.40*

\*Statistically significant ( $p < 0.05$ ) between the two groups along rows.

[27], the result we obtained could be due to the low number of young dogs sampled. It could also be due to the low level of immunity likely to be found in dogs of rural communities where adequate veterinary care is lacking or the fact that adult dogs rather than young dogs are used for hunting and thus earn the right to the offal. A higher prevalence of 11.11% was obtained in male dogs sampled when compared to the 8.11% of the female, although there was no statistical significant difference. This is in line with the research carried out by Budke [28] which suggests that male canids are more likely to be infected with *Echinococcus spp.* than females.

There are several rural communities in Oyo State Nigeria, with most of its inhabitants being either farmers or hunters or both. These two professions put the inhabitants at risk of the infection because of the dogs kept by the hunters. These dogs were observed to accompany their owners to the farms contaminating the soil and vegetables with their faeces and also come in close contact with the children and adults at home thus serving the dual purpose of been companion and hunting dogs. The fact that livestock industry is an important segment of the agriculture sector in Oyo state and livestock production is based on mainly extensive grazing system is a situation that has been reported to result in greater public health importance and economic impact of *Echinococcus* [29]. The involvement of wild animals in sylvatic cycle may also overlap and interact with the domestic sheep-dog cycle thus complicating the control efforts [30]. Since human infection has been correlated where canine infection exist [31], human hydatid diseases may be a time bomb waiting to explode in the rural areas where medical services are minimal and without the sophistication to detect the disease since the symptoms could take several years to manifest [32, 33] and its manifestation might be fatal resulting in a major public health issue. The emergence and re-emergence of zoonotic diseases are challenges to all professionals concerned with public health [34] thus the result of this study calls for a strategic and workable control programme through effective deworming of dogs especially in the rural areas and also the education of dog owners against feeding of raw visceral to their dogs. Health education is also essential as this can increase participation and maintain the continuity of long-term control especially in the consolidation phase [35].

#### CONCLUSION AND RECOMMENDATIONS

The outcome of this study confirms active infection of canine echinococcosis in the study area. Also rural hunting dogs that are more predisposed to the risk of

infection have a higher prevalence and this translates to the fact that rural dwellers are more at risk of cystic hydatid diseases. There is therefore the need for public health education, which should be conducted on a local government basis especially in the rural areas, adequate personal and environment hygiene should be maintained in order to protect children especially. The implication of feeding carcass and offal raw to dogs should be made known, further, there is the need to bring veterinary care close to the rural areas so as to enable prompt treatment and deworming of animals thus preventing zoonotic disease spread.

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