JOURNAL OF VETERINARY AND APPLIED SCIENCES
2019 VOL. 9 (1): 14 - 19
Manuscript No. JVAS/2018/052; Received: 13/09/2018; Accepted: 09/04/2019
Published by: Faculty of Veterinary Medicine, University of Nigeria, Nsukka, Nigeria

THE PREVALENCE OF *Cryptosporidium* INFECTION IN RABBITS IN ENUGU NORTH SENATORIAL ZONE OF ENUGU STATE, NIGERIA

Nwakaego E. Nweze*, Johnbosco U. Osuagwu, Paul C. Animoke, Ukamaka U. Eze

Department of Veterinary Medicine, Faculty of Veterinary Medicine, University of Nigeria, Nsukka, Enugu State, Nigeria.

==========

ABSTRACT

The study investigated the prevalence of Crytptosporidium oocysts in the faeces of apparently healthy rabbits in Enugu North Senatorial Zone of Enugu State. Faecal samples (101) were collected from rabbit farms and markets in three Local Government Areas within the study area and concentrated using the formal ether sedimentation technique. Staining was done using the modified Zeihl Neelson technique. Oocysts were identified microscopically using the oil immersion magnification. Data obtained were summarized as percentages and analyzed using and the Chi square test. Out of the 101 faecal samples examined, 20 (19.8%) contained Cryptosporidium oocysts. The highest prevalence (28.6%) was recorded from Igboeze South Local Government Area. Thirteen (18.8%) out of 69 kits and seven (21.9%) out of 32 conies were positive. Out of the 36 faecal samples from males and 65 samples from females, 7 (19.4%) and 13 (20%) respectively contained Cryptosporidium oocysts. Fifteen (17.2%) of the 87 well-formed faeces and 5 (35.7%) of the 14 semi-formed faeces were positive. There was no significant association between age, sex, faecal consistency and presence of Cryptosporidium oocysts in the rabbits. The results of this study represent preliminary information on the distribution of Cryptosporidium species in rabbits with respect to their age, sex and faecal consistency in Enugu North Senatorial Zone of Enugu State, Nigeria.

Keywords: *Cryptosporidium*, rabbits, prevalence, faeces, Enugu, Nigeria.

==========

INTRODUCTION

The mean daily animal protein intake by Nigerians is estimated at about 10 g/capital/day which is about 28.57% of the recommended 35 g/capital/day [1]. This low level impacts negatively on the growth and development of the Nigerian economy with respect to human productivity, infant mortality, malnutrition and related diseases [21]. Rabbit production is a veritable way of alleviating animal protein deficiency in Nigeria [3]. A rabbit is a micro livestock producing about 47 kg of meat per doe per year, which is enough to meet the animal protein requirements of a medium-sized family under small-scale rural farming system [4,5]. The rabbit has immense potentials which include high growth rate, high efficiency in converting forage to meat, short gestation period, high fecundity, relatively low cost of production and its

***Correspondence: E-mail: nwakaego.nweze@unn.edu.ng; Tel: +2348054132599**
ISSN: 2315 – 6856; e-ISSN: 2636 – 5553; *Website: www.jvasonline.com*

consumption is bereft of cultural and religious biases [6]. The white meat from rabbit is very nutritious, easily digestible and extremely low in cholesterol and sodium [7].

Diseases constitute limiting factors to rabbit husbandry and production and these include protozoan parasite, *Cryptosporidium*. *Cryptosporidium* species may be detected in juvenile or un-weaned rabbits with emaciation or diarrhoea but the clinical signs are often associated with concomitant infections with bacterial pathogens or other parasites [8]. Other signs like failure to thrive, lethargy, poor body condition, decreased appetite, dehydration, weight loss, poor coat condition and pasty diarrhoea can occur from 3-5 days post infection [9]. Neonates may show clinical signs while adults may be asymptomatic. Its prevalence is seen more in stressed (probably due to overpopulation which is usually the case in intensive system of rabbit production) and immunocompromised animals.

Cryptosporidiosis is also of public health importance as it is a zoonosis. *Cryptosporidium hominis cuniculum*, a subspecies of *C. hominis*, has been reported in rabbits and humans with prevalence of nup to 5% in wild rabbits [10]. More than 20 species of *Cryptosporidium* have been reported from domestic/wild animals, birds, rodents, fish, reptiles and humans [11]. It is the second highest cause of diarrhoeal disease of children (after *Rotavirus*), with the young population of 1-2 year olds mostly affected [12]. This study was therefore undertaken to find out the prevalence of cryptosporidiosis in rabbits reared in Enugu North Senatorial Zone of Enugu State, Nigeria.

MATERIALS AND METHODS

Study area

The animals used for the study were apparently healthy rabbits either kept at the Animal Science farm, University of Nigeria, Nsukka or brought for sale in local markets in three Local Government Areas (LGA) of Enugu North Senatorial Zone of Enugu State, Nigeria. The specific markets were Nkwo Ibagwa in Igboeze-South LGA, Orie Orba in Udenu LGA and Edem-Ani, Odim and Obukpa markets in Nsukka LGA.

Collection of Feacal samples

The rabbits included in the study were selected using the purposive sampling technique. A total of 101 faecal samples were collected from rabbits between February and May 2017. Freshly voided faecal samples were collected into well labeled sample bottles. They were examined visually for colour and consistency and then analyzed immediately or preserved in 5% formal saline if analysis was to be done at a later time. Field identity (sex, age and source) of each rabbit was recorded.

Laboratory examination of samples

Laboratory examination of samples was done at the Department of Veterinary Medicine laboratory, University of Nigeria, Nsukka. Faecal samples were concentrated prior to staining and microscopic examination in order to maximize oocyst recovery. Formalin ethyl acetate sedimentation technique was the faecal concentration method used [12]. Smears of sediment were stained using the modified Ziehl Neelsen stain [13]. Smears were fixed in methanol for 3 minutes, stained with strong Carbol Fuschin (primary stain) for 20 minutes and then rinsed thoroughly in tap water. Each smear was decolorized in acid alcohol for 15 seconds and rinsed thoroughly in tap water. Thereafter, the smears were counterstained with Methylene blue for 45 sec, rinsed thoroughly in tap water and air-dried. Microscopic examination was done at × 100 objective using oil immersion.

Statistical analysis

Results were analyzed and presented as percentages. Chi square (χ^2) was used to determine association between categorical variables. Significance was accepted at $p < 0.05$.

RESULTS

Out of a total of 101 faecal samples examined during the study, 20 (19.8%) were positive for *Cryptosporidium* oocysts (Fig. 1). The prevalence recorded from the LGAs in the study area is presented in Table 1. The highest prevalence was recorded from Igboeze South LGA (28.6%) followed by Nsukka LGA (20%) and Udenu LGA (10.0%).

The age distribution of rabbits sampled for *Cryptosporidium* oocysts shows that13 (18.8%) out of the 69 kits and 7 (21.9%) out of 32 conies were positive for *Cryptosporidium* oocysts. There was no significant ($p > 0.05$) association between age and the presence of *Cryptosporidium* oocysts in the faeces of rabbits sampled.

The sex distribution of rabbits shows that 7 (19.4%) out of 36 males and 13 (20%) out of 65 females were positive for *Cryptosporidium* oocysts. There was no significant ($p > 0.05$) association between gender and the presence of *Cryptosporidium* oocysts in the faeces of the rabbits.

Prevalence of *Cryptosporidium* oocysts based on nature of faecal samples shows that 15 (17.2%) out of 87 well-formed faeces and 5 (35.7%) out of 14 semi-formed faeces were positive for *Cryptosporidium* oocysts. There was no significant ($p > 0.05$) association between faecal consistency and presence of *Cryptosporidium* oocysts in faeces of rabbits.

Table 1. Percentage distribution of *Cryptosporidium* oocysts in rabbits according to location, age, faecal consistency and gender.

	Sample size	Number positive*	Prevalence (%)
All animals	101	20	19.8
Local Government Area			
Igboeze South	21	6	28.6
Udenu	20	2	10.0
Nsukka	60	12	20.0
Age			
Young	32	7	21.9
Adult	69	13	18.8
Consistency of faeces			
Formed	87	15	17.2
Semi-formed	14	5	35.7
Gender			
Male	36	7	19.4
Female	65	13	20.0

*No significant differences ($p > 0.05$) in prevalence within Local Government Areas or age, gender and the consistency of faeces of rabbits.

DISCUSSION

A prevalence of 19.8% was recorded in rabbits sampled from the different LGAs in Enugu-North Senatorial Zone of Enugu State, Nigeria. There are no previous data in the area for comparison with this result. However, this prevalence is higher than those obtained from China (2.38%) and United Kingdom (1.2%) and suggests that cryptosporidiosis is more prevalent in underdeveloped and developing countries than in developed ones [14,15]. Obtaining an accurate result requires expertise as many infections may be missed due to the miniscule size of the parasite, the presence of small numbers of organisms and possible confusion of the organism with *Eimeria* as has been done previously [16].

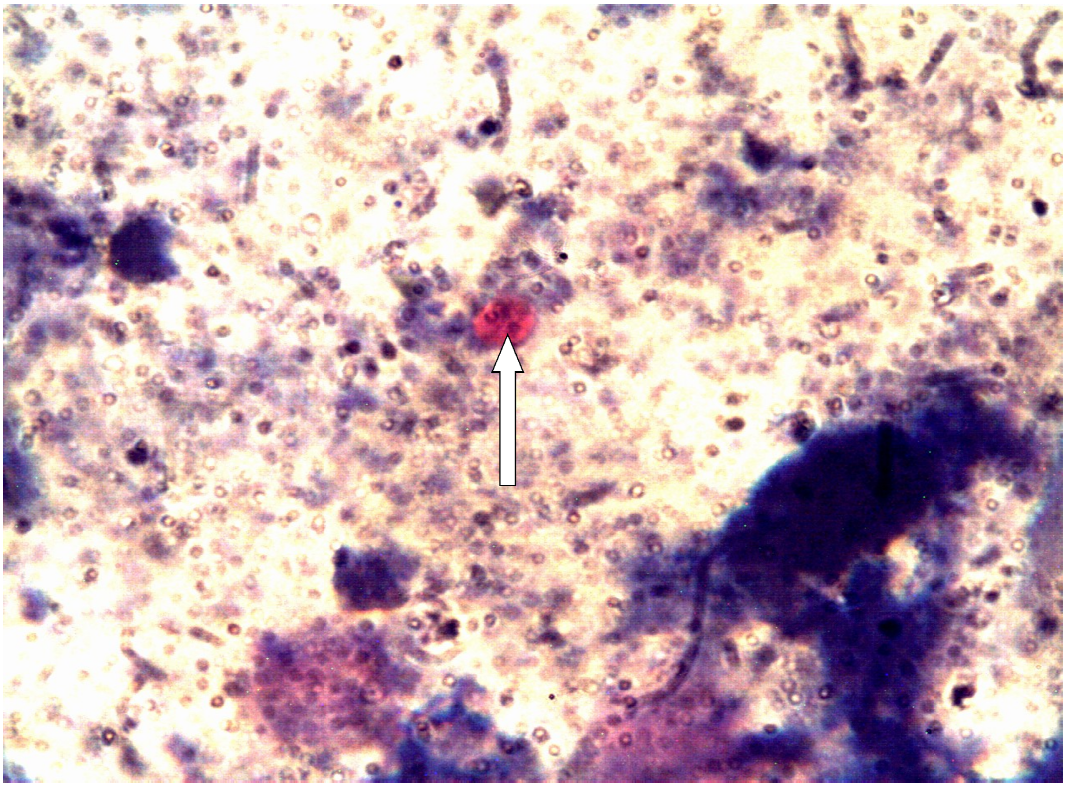

Figure 1. Ziehl Neelson stained faecal sample showing a *Cryptosporidium* oocyst (arrowed) at ×100 magnification.

Type of husbandry practice plays an important role in the prevalence of infection. Rabbits reared on deep litter have contact with their faeces and this aids transmission of infection due to ingestion of infective oocysts in contaminated feeds. Thus prevalence of cryptosporidiosis will be higher in rabbits on deep litter than in those reared in a cage. Infected rabbits may shed oocysts in the environment without manifesting clinical disease. *Cryptosporidium* oocysts can survive in an environment for a long time, are not susceptible to disinfectants and have low infective dose. All these factors help in maintaining the infection in a given population.

There was no significant association ($P > 0.05$) between age and the prevalence of *Cryptosporidium* oocysts in the rabbits sampled. This is in agreement with the study carried out by Chalmers, [15] but at variance with other reports [17] that suggest a significant association between age and the presence of *Cryptosporidium* oocysts and that cryptosporidiosis is more prevalent in younger animals/ humans than in adults.

No significant association ($p > 0.05$) was found between sex and the prevalence of *Cryptosporidium* oocysts in the faeces of rabbits. This is in contrast with previous studies [15,17,18] that suggested a significant association between sex and the presence of *Cryptosporidium* oocysts in the faeces of rabbits and that cryptosporidiosis is more predominant in females than males.

There was no significant association ($p > 0.05$) between faecal consistency and prevalence of *Cryptosporidium* oocysts in the faeces. This is in disagreement with the study carried out by Ukwah [19]. It should be noted that while *Cryptosporidium* has been found in rabbits with signs such as diarrhoea, the role of this infection in causing diarrhoea has not been confirmed [20].

This study has generated baseline data on the distribution of *Cryptosporidium* species in rabbits with respect to their age, sex and faecal consistency in Enugu North Senatorial Zone of Enugu State, Nigeria.

REFERENCES

1. FAO (1990). Food composition tables for use in Africa. Series number 37, Food and Agricultural Organization of the United Nations, Rome.
2. Onyenweaku, C. C. and Effiong, E. O. (2005). Technical efficiency in pig production in Akwa Ibom State, Nigeria. *International Journal of Agriculture and Rural Development*, 6: 51 – 57.
3. Ajala, M. K. and Balogun, J. K. (2004). Economics of Rabbit Production in Zaria, Kaduna State. *Tropical Journal of Animal Science*, 7: 1 - 10.
4. Abdulmalik, M. E. (1994). Rabbit production. advanced animal husbandry practices for subject matter specialists in the ADPs. In: *Training Manual for FACU/NAPRI Workshop*. Okaiyeto, P. O., Ndubuisi, A. H., Okoh, A. E, (eds.). FACU/NAPRI , Zaria, Nigeria, 1994.
5. Hassan, W. A. and Owolabi, R. O. (1996). Production performance of domestic rabbits in semi-arid zone of Nigeria. In: *Proceedings of the 6th World Rabbit Congress*, Toulouse, France, 359 - 363
6. Biobaku, W. O. and Oguntona, E. B. (1997). The effects of feeding multi nutrient mini blocks and pelleted diet on the growth of rabbits. *Nigerian Journal of Animal Production* 24: 147 - 149.
7. Omole, A. J., Omueti, O. and Ogunleke, O. J. (2005). Performance characteristics of weaned rabbits fed graded levels of dry cassava peel fortified with soycorn residue basal diet. *Journal of Food Agriculture and Environment* 3: 36 - 38.
8. Pakes, S. P. and Gerrity, L. W. (1996). Protozoal Diseases. In: *The Biology of Laboratory Rabbit,* 2nd Edn. Manning, P. J., Ringler, D. H., Newcomer, C. E. (eds.). Academic Press, London, pp. 205 – 230.
9. Morrisey, J. K. (1996). Parasites of ferrets, rabbits and rodents. *Journal of Exotic Pet Medicine,* 5: 106 – 114.
10. Robinson, G., Wright, S., Elwin, K., Hadfield, S. J., Katzer, F., Bartley, P., Hunter, P., Nath, M., Innes, E. and Chalmers, R. (2010). Re-description of *Cryptosporidium cuniculus* Inman and Takeuchi, 1979 (*Apicomplexa*: *Cryptosporidiidae*): morphology, biology and phylogeny. *International Journal of Parasitology*, 40: 1539 – 1548.
11. Jirku, M., Valigurova, A., Kondela, B., Krizek, J., Modry, D. and Šlapeta, J. (2008). New species of *Cryptosporidium* Tyzzer, 1907 (*Apicomplexa*) from amphibian host: morphology, biology and phylogeny. *Folia Parasitologica* 55: 81–94.
12. Xiao, L. (2010). Molecular Epidemiology of Cryptosporidiosis: An Update. *Experimental Parasitology*, 124: 80 - 89.
13. Ukaga, C. N., Onyeka, P. I. K. and Nwoke, B. E. B. (2002). *Practical Medical Parasitology for Biological and Medical Students.* Avan Global Publication, Owerri, Nigeria.
14. Garcia, L. S. and Shimizu, R. (1981). Comparison of clinical results for the use of ethyl acetate and diethyl ether in the Formalin – ether sedimentation technique performed on polyvinyl alcohol preserved specimens. *Journal of Clinical Microbiology*, 13: 709 - 713.
15. Morse, T. D., Nichols, R. A., Grimason, A. M., Campbell, B. M., Tembo, K. C. and Smith, H. V. (2007). Incidence of cryptosporidiosis species in paediatric patients in Malawi. *Epidemiology and Infection*, 135: 1307 – 131.
16. Chalmers, R. M., Hadfield, S. J., Jackson, C. J., Elwin, K., Xiao, L. and Hunter, P. (2008). Geographic linkage and variation in *Cryptosporidium hominis*. *Emerging Infectious Diseases*, 14: 496 – 498.
17. Ryan, M. J., Sundberg, J. P., Sauerschell, R. J. and Todd, K. S Jr. (1986). *Cryptosporidium* in a wild cotton tail rabbit (Sylvilagus floridanus). *Journal of Wildlife Diseases*, 22: 267.
18. Mason, B. W., Chalmers, R. M., Carnicer-Pont, D. and Casemore, D. P. (2008). A *Cryptosporidium hominis* outbreak in North-West Wales associated with low oocyst counts in treated drinking water. *Journal of Water Health*, 8: 299 – 310.

19. MacKenzie, W. R., Hoxie, N. J., Proctor, M. E., Gradus, M. S., Blair, K. A., Peterson, D. E., Kazmierczak, J. J., Addiss, D. G., Fox, K. R., Rose, J. B. and Davis, J. P. (1994). A massive outbreak in Milwaukee of *cryptosporidium* infection transmitted through the public water supply. *New England Journal of Medicine*, 331: 161 - 167.
20. Ukwah, B. N. (2015). Epidemiology of Cryptosporidiosis in some communities in Ebonyi and Enugu States, Nigeria. PhD, University of Nigeria, Nsukka.
21. Zhang, W., Shen, Y., Wang, R., Liu, A., Ling, H., Li, Y., Cao, J., Zhang, X., Shu, J. and Zhang, L. (2012). *Cryptosporidium cuniculus* and *Giardia duodenalis* in Rabbits: Genetic diversity and possible zoonotic transmission. *PLoS ONE* 7 (2): PLoS ONE 7(2): e31262. https://doi.org/10.1371/journal.pone.0031262.