VOL. 22 NO. 1
ISSN: 2877-1990
SEPTEMBER, 2021

African Scholar Publications & Research International

African Scholar Journal of Agriculture and Agricultural Tech. (JAAT-1)

Cryptosporidium Infection In Free Roaming Native Chickens From Kebbi State, Nigeria.

Danladi Y. K and Garba M. Y.

Department of Animal and Environmental Biology, Kebbi State University of Science and Technology, Aliero

Abstract

Data elucidating the incidence of a significant diarrhea causing pathogen, *Cryptosporidium* in native domestic chickens, are relatively scarce in Northern Nigeria. This study was carried out to determine the incidence and factors associated with the infection in free roaming domestic chickens in the area. A total of 300 feacal samples from live and slaughtered birds were randomly collected either as bird's fresh droppings or by cutting open an eviscerated intestine of slaughtered chicken, while noting their sex, age and diarrhea condition. Samples were analysed by concentration of stools and modified Ziehl-Neelson staining technique. Overall, *Cryptosporidium* oocysts were present in 75 of 300 fowls examined (25.0%). Logistic regression analysis reveals that diarrheic fowls were four times prone to infection than the non-diarrheic (Odds Ratio [OR]= 4.088; 95% CI= 2.327-7.183; P < 0.0001). Young chickens shaded more oocycts than the adults, with no significant variation (Young: 27.3% vs Adult: 24.1%, P = 0.558). Also, infection showed no sex related differences distribution (Males: 23.1% vs Females:27.1%, P = 0.806). *Cryptosporidium* oocysts were common in domestic chickens in Kebbi State. Diarrheal condition of chickens was significantly associated with presence of oocycsts. The wide spread presence of oocysts is of public health significance, since some infections with the human-pathogenic species are known to be from avian sources. Therefore,

educating owners on the need for good hygiene and management standards will minimize environmental contamination.

Keywords: *Cryptosporodium*, oocysts, incidence, chickens, kebbi

Introduction

There's an increasing demand of livestock products like poultry in Nigeria and across Africa. Nigeria's poultry Association reports that annual demand for poultry products exceeded $1.39 billion in 2017[1]. Amongst all kinds of poultry farming, chickens are the commonest. Chickens and eggs are in constant demand and has become a lucrative agricultural practice providing a significant source of animal proteins the world over. This could be attributed to the fact that it has low production costs, with little or no religious or cultural restrictions on the use of the products in most nations [2]. Poultry cryptosporidiosis caused by the protozoa zoonotic parasite of the genus *Cryptosporidium*, is an important parasitic disease in the poultry industry. The distribution and economic significance of the disease has been reported in different countries such as Algeria, China, Germany and of recent, Bangladesh, [3,4,5 and 6 respectively]. The infection occurs through ingestion of food or water contaminated with viable environmentally resistant oocysts. So far, infection in birds are predominantly coursed by four important species: *C. baileyi, C. galli, C. meleagridis* and *C. avium* [7]. The parasite has been reported in wild, domestic and captive birds [8].

The commonest clinical signs associated with C. *meleagridis* infection in chickens are diarrhea and decreased growth. The feaces are greenish [9,10, 3]. The parasite infects several animal and human hosts. From previous studies, infection has been reported in over 170 host species[11, 12, 13]. Most human infection is mainly caused by *C. parvum.* However the two main avian species (C. baileyi and C. meleagridis), have also been reported to infect humans[14, 15, 16].

In Nigeria *Cryptosporidium* infection has been reported in humans,

ruminants and Pigs [17, 18, 19 respectively], but there's dearth of information, especially on the extent of infection in local domestic chickens in Northern Nigeria. The potential threat of the zoonotic pathogen on man and other animals should not be underrated. Therefore this study was carried out to determine the prevalence and factors associated with *Cryptosporidium* infection in local free range chickens in Kebbi State

MATERIALS AND METHOD

Study area

This study was conducted in Kebbi State in Northwestern Nigeria. It is located at approximately latitutdes 11° 30'N and longitudes 4°N 00'E. The state has a total land area of approximately 37,728 sq. km, with a population of 3,256,541 people [20]. The state is located in a region with favourable climate, characterized by five months of rain (June - October) and seven months of dryness (November – May). The vegetation is predominantly savannah type with pockets of woodland vegetation along the river basins. Kebbi state is an agriculturally viable area, endowed with high soil fertility, vast farm lands and economically viable rivers (e.g. River Niger and River Rima) sheltered by fine tropical climate. Owing to these factors, agriculture has remained the major source of revenue and indeed the backbone of the economy of the State. The majority of the population are rural dwellers, therefore a large percentage of the people are farmers.

Poultry Management System

The commonest of all system of poultry management in this study area and most African countries is the extensive system. Most rural households in Nigeria practice this method of production. Under this system, birds are allowed to freely scavenge for food and other nutritional needs with no restriction. Birds are not vaccinated at any level and housing may or may not be provided. This type of husbandry is often characterized by low productivity, poor feeding and disease control. The system though cheap for owners, is often attendant with several risks such as high mortality due to diseases, predation and loss through theft.

Sample Collection and Processing

Faecal samples were randomly collected from Markets, chicken dressing slabs, homes. A total of 300 feacal samples from live and slaughtered birds, were randomly collected either as bird's fresh droppings or by cutting open an eviscerated intestine of slaughtered chicken, while noting their sex, age and diarrhea condition. All faecal samples were immediately placed in sample bottles and labeled appropriately. These are then transported in cold boxes to the Biology Laboratory in Kebbi State University of Science and Technology, Aliero where they are analysed and screened for *Cryptosporidium* oocysts.

Modified Ziehl-Neelson acid fast technique for detection of Cryptosporidium Oocysts

One to two drops of concentrated stool was smeared on the slide and air dried. This was fixed with absolute methanol for 1 minute. The slide was flooded with carbol fuchsin for 15 minutes and rinsed thoroughly with water and decolorized with 1% alcohol for 2 minutes after which it was rinsed with water. The smear was then counter stained with methylene blue for 1minute and rinsed again with water. This was finally air dried and examined under the microscope using oil immersion. Where positive, oocysts are round and stain red against a blue background.

Identification of parasites

Parasite objects of domestic animals were identified according to Souslbly [21].

Statistical Analysis

Statistical analysis was performed using the version 15.0 Statistical package for Social Sciences (SPSS Inc, Chicago, IL) on windows 10. Chi square test was used to determine the differences in relative frequencies and possible association between infection and other exposure variables. Logistic regression analyses were carried out to determine independent risk factors associated with cryptosporidiosis in the study. Associations were considered significant at $P < 0.05$.

RESULT

Incidence of Cryptosporidium infection in free ranging poultry

In total, 300 samples from free ranging fowls were screened for *cryptosporidium* infection.

Overall, *Cryptosporidium* infection was present in 75 of 300 fowls examined (25.0%). Logistic regression analysis reveals that diarrheic fowls were four times prone to infection than the none diarrheic (OR= 4.088; 95% CI= 2.327-7.183; P < 0.0001). Although young chickens shaded more oocycts than the adults, the incidence showed no significant variation (Young: 27.3% vs Adult: 24.1%, P = 0.558). Also, infection revealed no age related differences in distribution (males:23.1% vs 27.1%, P = 0.806)

Table 1: Incidence of *Cryptosporidium* oocysts and associated risk factors for infection in native chickens in Kebbi State

Parameter	Number Examined	Number Infected (%)	OR	95% CI	P-Value
Overall	300	75(25.0)			
Age					
Young	88	24(27.3)	0.759	0.417-1.382	0.558
Adult	212	51(24.1)			
Diarrheal Status					
With diarrhea	96	42(43.8)	4.088	2.327-7.183	**<0.001**
Without diarrhea	204	33(16.2)			
Sex					
Male	160	37(23.1)	0.932	0.532-1.634	0.806
Female	140	38(27.1)			

Discussion

Avian *Cryptosporidium* infection have been reported in more than 30 species worldwide [22]. However, only relatively few studies have examined the infection in local domestic chickens and other birds in Northern Nigeria.

The overall incidence of *Cryptosporidium* infection was 25.0% in the study. This is higher compared to reports from other parts of Nigeria. For example, [8, 23,], reported 20.6%, in local chickens, [22] 6.6% in Kano. The result also is comparatively higher than those previously reported from China (8.9%) [24, 4]; Syria (9.9%) [25]. Such variations might have risen from different factors such as differences in geographical locations, sampling periods, sample sizes and this could also be influenced by other favorable factors for disease transmission [26].

Cryptosporidium infection has been reported most times in broiler chickens in several countries including, Tunisia, Iran, Algeria, china, Syria, Germany, [27,28,4,,25,5 respectively]. The relatively higher prevalence reported in this study, could also be explained by the poor management practices in both commercial and the back yard poultry farming. For example, the practice of providing common poultry drinkers at home for all scavenging birds, significantly encourages *Cryptosporidium* buildup [23].

Infection was higher in younger birds than adults, this agrees with the findings by [4], who indicated that although all chickens are susceptible to infection, young birds are more susceptible than the older birds. However, the distribution in this study was not statistically significant. Our finding in this regard was similar to those of [29, 30], who reported more burdens in younger chicks than the older birds. The reason for this might be attributed to the immature immune system in chicks, leaving them susceptible even at low infection doses. In addition, since birds are not vaccinated against *Cryptosporidium*, high morbidity could be observed in birds suffering from the disease.

The infection rates with respect to the sex of birds, indicated that females had relatively higher loads compared to males (27.1% vs 23.1% respectively). However, this has no significant effect on the distribution (P=0.806). This could mean that both sexes have similar chances of acquiring and becoming infected with oocysts during feeding or in an outbreak situation. This observation is consistent with previous a report [8].

In conclusion, infection was common to both ages and sexes of birds. Oocysts were present to a significant extent in diarrheal than the healthy birds. The wide presence of oocycts is of public health significance. Although this study did not focus on particular species, it reveals the potential health related danger of infection with the human-pathogenic species like *C. meleagridis* and others, from avian sources. Also, the common practice of free roaming of chickens and

other domestic birds under hygienically poor conditions, though cheap for owners, has its hazards as this have the potential to increase oocyst acquisition by birds and environmental contamination. Further studies are recommended to provide evidence for other sources and factors that might influence avian cryptosporidiosis in the area.

References

[1] AsokoInsight, 2019: https://www.asokoinsight.com.nigeria).

[2]. Lawal J R, Jajere S M, Ibrahim U I, Geidam YA, Gulani IA, Musa G, Ibekwe BU (2016) Prevalence of coccidiosis among village and exotic breed of chickens in Maiduguri, Nigeria. *Veterinary World,* 9(6), 653-659.

[3.] Baroudi D, Khelef D, Goucem R, Adjou KT, Adamu H, Zhang H, et al (2013). Common occurrence of zoonotic pathogen *Cryptosporidium meleagridis* in broiler chickens and turkeys in Algeria. *Veterinary Parasitology.* 196:334–40.

[4]. Wang L, Xue X, Li J, Zhou Q, Yu Y, Du A (2014). Cryptosporidiosis in broiler chickens in Zhejiang Province, China: molecular characterization of oocysts detected in fecal samples. *Parasite. 21:36.*

[5]. Helmy, Y.A., Krücken J., Abdelwhab, E.M., von Samson-Himmelstjerna G., Hafez, H.M. (2017). Molecular diagnosis and characterization of *Cryptosporidium* spp.In turkeys and chickens in Germany reveals evidence for previously undetected parasite species, *PLoS One* 12 (6) e0177150.

[6]. Kabir et al 2020

[7]. Nakamura, A.A. and Meireles, M.V. (2015). *Cryptosporidium* infections in birds-a review, *Rev.Bras. Parasitol. Vet*. 24 253–267.

[8]. Bamaiyi, P. H., Jarlath U. Umoh, Paul A. Abdu & Idris A. Lawal (2013). The Prevalence of *Cryptosporidium* Oocysts in Birds in Zaria, Nigeria. *Borneo J. Resour. Sci. Tech.* 2(2): 52-59

[9]. Goodwin M. A., (1988). Small intestinal cryptosporidiosis in a chicken. *Avian Diseases*, 32, 844 – 848

[10]. Gharazouglou, M.J., Dezfoulian, O., Rahbari, S., Bokaie, S., Jahanzad, I., Razavi, A.N.E., 2006. Intestinal cryptosporidiosis in turkeys in Iran. *J.Vet. Med. Ser.* A 53, 282–285.

[11]. O'Donoghue, P.J. (1995). Cryptosporidium and Cryptosporidiosis in Man and Animals. *International Journal of Parasitology*, 25: 139-195.

[12]. Nagano, Y., Finn, M., Lowery, C., Murphy, T., Moriarty, J., Power, E., Toolan, D., O'Loughlin, A., Watabe, M., McCorry, K., Crothers, E., Dooley, J., Rao, J., Rooney, P., Millar, B., Matsuda, M., Elborn, J., & Moore, J. (2007). Occurrence of Cryptosporidium Parvum and Bacterial Pathogens in Faecal Material in the Red Fox (Vulpes Vulpes) Population. *Veterinary Research Communications,* 31(5): 559-564.

[13]. Sevá, A.P., Funada, M.R., Richtzenhain, L., Guimarães, M.B., Souza, S.D.O., Allegretti, L., Sinhorini, J.A., Duarte, V.V., & Soares, R.M. (2011). Genotyping of *Cryptosporidium* spp. From Free- Living Wild Birds from Brazil. *Veterinary Parasitology,* 175(1-2): 27-32.

[14]. Ditrich O., Palcovic, L., Sterba, J., Prokopic, J., Loudova, J. and Giboda, M. (1991). The first finding of *Cryptosporidium baileyi* in Man. *Parasitology Research*, 77: 44- 47

[15]. Qi M., Wang R., Ning C., Li X., Zhang L., Jian F., Sun Y., and Xiao L. (2011). *Cryptosporidium* Spp. In pet Birds: Genetic Diversity and Potential Public Health Significance. *Experimental Parasitology* 128(4):336- 340

[16]. Plutzer J. and Tomor B. (2009). The role of aquatic birds in the environmental dissemination of human pathogenic Giardia duedenalis cycts and *Cryptosporidium* oocysts in Hungary. *Parasitology international*, 58(3):227-231

[17]. Molloy, S. F., Tanner, J., Kirwan, P., Asaolu, S. O., Smith, H. V., Nicholas, R. A. B., Connelly, L., and Holland, C. V. (2011). Sporadic *Cryptosporidium* infection in Nigerian children: Risk factors with species identification. *Epidemiology of Infection.* 139:946-948.

[18]. Danladi, Y.K., and Ugbomoiko, U. S. (2015). Epidemiology of Cryptosporodiosis in Ruminant Species in Kebbi State, Nigeria. *IOSR Journal of Agriculture Sand Veterinary Science*,8(12): 39-44.

[]19. Maikai B.V., Umoh J.U., Kwaga J.K.P., Maikai V.A. and Egege S.C. (2009). Prevalence and risk factors associated with faecal shedding of *Cryptosporidium* oocysts in piglets, Kaduna, Nigeria.*Journal of Parasitology and Vector Biology*, 1(1): 1–4.

[20.] National Population Commission, (2006): National Population Commission, (2006). http//www.population.gov,ng/index.php/about-np.

[21]. Soulsby E.J.L., (1986). *Helminths, Arthropods and Protozoa of Domesticated Animals*. 7th edition, Bailliere Tindall, London

[22]. Ryan, U.M. (2010). *Cryptosporidium* in birds, fish and amphibians. *Experimental Parasitology*.124:113-120

[23]. Mustapha M. A., Wakawa A. M. and Abdu P. A. (2016). Occurrence and risk factors associated with feacal shedding of *Cryptosporidium* oocysts in Avian Species in Kano metropolis, Nigeria. *Nigerian veterinary Journal*. 37(4): 247- 253

[24]. Wang R, Jian F, Sun Y, Hu Q, Zhu J, Wang F, et al(2010). Large-scale survey of *Cryptosporidium* spp. in chickens and Pekin ducks (Anas platyrhynchos) in Henan, China: prevalence and molecular characterization. *Avian Pathology.* 39:447–51.

[25]. Kassouha M *(2*014). First detection of *Cryptosporidium* spp. In broiler chickens in Syria. *Basrah Journal of Veterinay Research.* 11:253–9. Kassouha M.(2014). First detection of *Cryptosporidium* spp. in broiler chickens in Syria. *Basrah J Vet Res*. 11:253–9.

[26]. Sréter, T. & Varga, I. (2000). Cryptosporidiosis in Birds - a Review. *Veterinary Parasitology*, 87(4): 261-279.

[27]. Soltane R, Guyot K, Dei-Cas E, Ayadi A(2007). Prevalence of *Cryptosporidium* spp. (Eucoccidiorida: Cryptosporiidae) in seven species of farm animals in Tunisia. *Parasite*. 14:335

[28]. Shemshadi B, Bahadori SR, Mozafari A*(*2011). Study on cryptosporidiosis incidence in broilers in Garmsar region, Iran. *Comparative Clinical Pathology*. 20:143–9

[29]. Lindsay D. S., Blagburn B. L.,Sundermann C. A.,Giambrone J. J. (1988). Effect of Broiler Chicken Age on Susceotibilty to Experimentally Induced *Cryptosporidium baileyi* Infection. *American Journal of Veterinary Research 49(8):1412- 1414*

[30]. Obinuju N. O., Ikenna O. E., Ukamaka E,U. Ekene W. E., Nzeakor T. A. and Maduike C.O. E. (2021). Prevalence and some predisposing factors associated with

Cryptosporidium infection in domestic poultry in Enugu State, Nigeria. *Nigeria Journal of Parasitology* 42(1):129 - 136