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PREVALENCE OF *CRYPTOSPORIDIUM* INFECTION IN CATTLE IN MAIDUGURI, NORTH EASTERN NIGERIA

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ABSTRACT

A study was carried out to survey the prevalence of *Cryptosporidium* infection in cattle in Maiduguri, Northeastern Nigeria. A total of four hundred (400) fecal samples from cattle were randomly collected and examined for the presence of *Cryptosporidium* sp. oocysts using the modified Ziehl-Neelsen (MZN) staining method. The results showed that the overall prevalence of infection was 22.3%, with an infection rate of23.4% in adult cattle and 19.1% in young cattle, respectively. There was no statistical significant difference ($P \leq 0.05$) between the age groups, with (OR: 1.298; 95%CI: 0.7507–2.245). Out of 89 positive samples, 21.2% were male and 25.0% were female, respectively. There was no statistical significant difference ($P > 0.05$) between the sex, with (OR: 0.8062; 95% CI: 0.4828–0.346). It was concluded that *Cryptosporidium* sp. infection is prevalent in Nigeria; and cattle could serve as reservoirs for the zoonotic infection in humans.

Key words: *Cryptosporidium* sp., cattle, maiduguri, oocyst, prevalence, Nigeria

INTRODUCTION

Cryptosporidium is an apicomplexan intestinal protozoon, which infects animals and humans gastrointestinal tract and causes cryptosporidiosis (Carey *et al*., 2004; Huang and White, 2006). The infection causes cryptosporidial diarrhea, which is commonly a short-lasting benign diarrhea. In addition it can cause severe diarrhea in immunocompromised host (Huang and White, 2006; Collinet-Adler and Ward, 2010). Some of the zoonotic *Cryptosporidium* species (*C. parvum*, *C. meleagridis*, *and C. canis*) usually causes self-limiting diarrhoea in human and animals and could be a great public health concern worldwide (Minas *et al*., 1994; De Graaf *et al*., 1999; Castro-Hermida *et al*., 2002; Graczyk *et al*., 2003; Joachim, 2004; Caccio, 2005). Cryptosporidiosis is more severe in newborn animals and causes severe diarrhea that is sometimes accompanied with anorexia, reduced milk intake, dehydration, growth retardation, stiffness, hyperpnoea, slow gait and depression (Casemore *et al*., 1997; Fayer, 2004). Although the adult animals are generally refractory to infection, infected animals can act as asymptomatic carriers and shed large numbers of oocysts into the environment and remain a main source of infection to other domestic and wild animals (Xiao *et al*., 1993).

Cattle cryptosporidiosis is widespread and studies have shown a wide range of oocyst shedding dynamics depending on the age, clinical situation and breeding system of the animals (Maldonado-Camargo *et al*., 1998). Although cattle are the most common domestic animals and the major meat-producing animals in Nigeria with economic value, there is no readily available data on cryptosporidiosis in cattle in Nigeria. Cattle are being reared and come close to human sources of water and farms during grazing due to semi-intensive management systems. The potential hazard that *C. parvum* from cattle poses to public health in Nigeria, therefore, makes it necessary to investigate the prevalence of cattle cryptosporidiosis and also understand the factors that lead to the transmission and spread of infection in animals and humans.

This study is aimed at investigating the prevalence of *Cryptosporidium* infection in cattle in Maiduguri, Northeastern Nigeria, with the view that this knowledge will serve as a basis for screening the *Cryptosporidium* species in cattle in Nigeria and to facilitate further studies on the zoonotic transmission of the disease from animals to humans.

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MATERIALS AND METHODS

Study Area

Borno State is situated in the Northeastern part of Nigeria. The state lies between latitude 10°N and 13°E and longitude 12°N and 15°E. The state has a total area of 69,436 square kilometers, with a population of 4,151,161 people. It occupies the greatest part of the Chad Basin. The state has two vegetation zones viz: Sahel in the North which is hot and with severe desert encroachment covering most of the Chad Basin areas and Sudan Savannah in the South which is slightly milder. The rainy season normally begins from June- September in the North and May-October in the South with relative humidity of 49%. Borno State shares boundaries with the Republic of Niger to the North, Chad Republic to the North-east and Cameroon to the East. Within the country, the state shares border with Adamawa to the south, Yobe to the West, Bauchi and Gombe to the South-west (GSN, 1994).

Sample Collection, Transportation and Storage

A total of four hundred (400) fecal samples from cattle comprising of 175 male and 225 females of both young and adults were collected directly from the rectum of each animal by means of disposable plastic bag and emptied into a wide-mouthed disposable plastic container. The fecal samples were transported to the laboratory and preserved in 75% alcohol at room temperature until processed (Jongwutiwes *et al*., 2002).

Cryptosporidium oocyst detection

The collected fecal samples of each animal were examined by direct smear techniques. To determine oocysts shedding, the negative faecal samples by direct smear examination were concentrated by centrifugal sedimentation (2,500 rpm for 2 min) and Clayton-Lane flotation techniques using standard Sheather solution (sg 1.12) (Soulsby, 1982; Hendrix, 1998). The presence of *Cryptosporidium*- like oocysts in all samples was confirmed by modified Ziehl-Neelsen (MZN) staining (Henricksen and Polenz, 1981). The diameter of 100 *Cryptosporidium* like oocysts of each infected cattle was measured at 1,000 × magnification. Each positive sample was considered when at least one oocyst with the correct morphologic characters was observed (*Cryptosporidium* - like oocysts were 4–6 µm and spherical containing a residuum, sporozoites and usually within a clear halo, against a blue background) (Soulsby, 1982; Baxby *et al*., 1984).

Statistical analysis

The data were analysed using Chi-square test with GraphPad in Stat (statistical) software. A Chi-square test was used to compare the differences in prevalence of *Cryptosporidium* oocysts between age-groups of cattle at a 5% level of significance.

RESULTS AND DISCUSSION

The prevalence of cryptosporidiosis was studied on the basis of the detection of oocysts in the fecal samples collected from Maiduguri abattoir. Out of 400 fecal samples screened, 89 (22.3%) animals were found positive for cryptosporidiosis by modified Ziehl-Neelsen (MZN) staining method. The infection rate with *Cryptosporidium* spp. was higher in adult cattle with the prevalence of 23.4% (68/290) while in the young calves the prevalence rate lower 19.1% (21/110) respectively. There was no statistical significant difference (P>0.05) between the age group (Table 1). Some of the infected animals showed wasting, diarrhoea and debility. Older cattle with shedding oocysts in faeces did not show symptoms of cryptosporidiosis. Based on sex distribution, thehighest prevalence was found in female 25.0% (28/112) while in the male the prevalence was lower 21.2% (61/288) respectively. There was no statistical significant difference (P>0.05) between the sex of the animals tested (Table 2).

Table 1. Prevalence of *Cryptosporidium* infection in cattle with age group in Maiduguri, Northeastern Nigeria

Age	Number Examined	Number Infected	Percentage	OR	P value	95% CI	
						Lower	Upper
Adult	290	68	23.4				
Young	110	21	19.1	1.298	0.4232	0.7507	2.245
Total	400	89	22.3				

Table 2. Prevalence of *Cryptosporidium* infection in cattle with sex in Maiduguri, Northeastern Nigeria

Sex	Number Examined	Number Infected	Percentage	OR	P value	95% CI	
						Lower	Upper
Male	288	61	21.2				
Female	112	28	25.0	0.8062	0.4897	0.4828	1.346
Total	400	89	22.3				

The overall prevalence (22.3%) of *Cryptosporidium* in cattle obtained in this study is consistent with that observed in cattle from South West parts of Nigeria 23.4% (Ayinmode and Fagbemi, 2010),from other parts of the world:19% of calves in Spain (Panciera *et al*., 1971), 20% of calves in Canada (O'donoghue, 1995); 19–36%of cattle in Germany (Joachim *et al*., 2003); 35% of calves in the United States of America (Santin *et al*., 2004); and 24.2% of cattle in Bangalore, South India (Mallinath *et al*., 2009. The result of this study thus implies that *Cryptosporidium*infection in cattle, as well as the possible risk of transmission to humans by cattle, is important in the study area as it is elsewhere in the world. Therefore, considerable attention should be paid to preventing the spread of the infection.

Based on this study, it was observed that there was no statistical significant difference between the rate of the infection in cattle based on age distribution (P>0.05), though the infection rate was higher amongst adults cattle than the younger cattle. Similarly there was no statistical significant difference between the rateof infection and sex distribution of cattle ((P>0.05), though the infection rate was higher among female cattle than male.

This study was in contrast with those made by Ongerth and Stibbs (1989), Shobhamani (2005), Jayabal and Ray (2005), Roy *et al*. (2006), and Mehdiazami (2007) who reported higher rates of infection among calves thanadult cattle. The study indicated that the adult animals were highly susceptible to infection with cryptosporidiosis compared to young animals. This could be as a result of other factors likemanagement practice, concurrent infection, seasonal variation, and others than the sole impact of *Cryptosporidium* species. From these findingsefforts should be directed towards the diagnosis and prevention of Cryptosporidiosis in Nigeria so as to prevent the transmission of the disease to human beings.

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