

High Prevalence of *Eimeria* Infection in Red Sokoto Goats in Sokoto, Nigeria

Abubakar I.A.¹, Sannusi, A.¹, Muhammed, A.A.¹, Daneji, A.I.², Elsa, A.T.³,
Abubakar, U.⁴

¹(Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto, Nigeria)

²(Department of Veterinary Medicine, Faculty of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto)

³(Department of Veterinary Surgery and Radiology, College of Veterinary Medicine, Federal University of Agriculture, Makurdi, Nigeria)

⁴(Department of Biological Sciences, Faculty of Science, Usmanu Danfodiyo University, Sokoto, Nigeria)

Abstract:

Background: Prevalence of *Eimeria* infection among Red Sokoto goats was investigated between August 2003 and July 2004 in Sokoto, Nigeria.

Materials and Methods: Rectal faecal samples of 89 goats were screened for *Eimeria* oocysts using a modified direct wet faecal smear technique. Data was analyzed using descriptive statistics.

Results: Overall high prevalence of 98.8% of *Eimeria* infection was found. Similar prevalence was found among the levels of systems of management, age and sex factors of the animals examined.

Conclusion: It was concluded that there was high prevalence of *Eimeria* infection among Red Sokoto goats between different age groups, sexes and management systems in the Sokoto area.

Key Word: Prevalence; coccidian; Red Sokoto goat.

Date of Submission: 12-11-2020

Date of Acceptance: 28-11-2020

I. Introduction

Goats account for about twenty-two percent of total grazing ruminants in the developing countries; Nigeria being among countries with the largest population of goats in Africa (FAOSTAT, 2020). The goat population of over 7.9 million in Nigeria makes it the second most important livestock species (FAOSTAT, 2020). The importance of coccidiosis due to *Eimeria* infection in small ruminants has not been adequately evaluated in Nigeria (Anene et al., 1994) even though in sub-Saharan Africa (Kusiluka and Kambarage, 1996) and worldwide, it is one of the most economically important diseases of the goat industry, causing unthriftiness and lowered productivity leading to economic losses to the producers (Foreyt, 1990; Khodakaram-Tafti and Hashemnia, 2017). Mortality rate of 86% associated with coccidiosis outbreak in small ruminants has been reported in Nigeria (Kusiluka and Kambarage, 1996). The few specific reports on coccidia and coccidiosis in goats in Nigeria associated with distribution (Opoku-Pare and Chineme, 1979; Majaro and Dipeolu, 1981; Adefolabi and Chiejina, 1987; Anene et al., 1994; Woji et al., 1994) justifies the need for further investigation on the prevalence of the *Eimeria* infection in Red Sokoto (Maradi) goats, which is the most common breed in the semi-arid Sokoto State (RIM, 1992), since most reported studies were carried out in the humid zones of Nigeria and in other breeds common to those zones (Adefolabi and Chiejina, 1987; Anene et al., 1994; Woji et al., 1994). The objective of this study is to explore and determine the prevalence of *Eimeria* infection among the Red Sokoto goats in Sokoto in relation to systems of management, age and sex.

II. Material And Methods

Study area

The study was conducted in Sokoto state (located between longitude 11°30' to 13°30' E and latitude 4° to 6° N), a semi-arid region of north-western Nigeria marked by distinct weather conditions –the wet and dry seasons. The short rainy season lasts for about 3-5 months, which usually starts from May or June till September or early October, depending on the rainfall pattern for that year (Adelana et al., 2003). The annual rainfall is about 700mm and relative humidity between 30-57% (Anon., 2004). Between November and March is the dry harmattan period, which is completely without rain, but dust-laden and cold winds blow in from the northwest with a lowest temperature record of 11°C in January (Adelana et al., 2003). The departure of harmattan and the onset of rain are usually marked by a hot sunny dry season having temperature range of 37-43°C with the

highest temperature in April. This is the period of little or no cloud cover resulting in wide diurnal temperature ranges which varies between 21-27°C (Adelana *et al.*, 2003).

Animals, Study Design, Sample Collection and Processing

The Red Sokoto goat sampled in this study were phenotypically identified (Wilson, 1991). It was not possible to obtain random sample of goats in the study area due to limited access to the animals for example, at the time of sampling, there is no official demographic information on goat distribution among household within the localities of Sokoto and some owners did not allow their goats to be sampled. Fresh faecal samples from the goats were conveniently collected per rectum per goat from August 2003 to August 2004 within five locations of Sokoto. Faecal samples were collected using disposable hand gloves from 89 (35, < 1 year/ young and 54, > 1 year/adult) Red Sokoto goats from four institutional herds, which include Usmanu DanFodiyo University (UDU) and Sokoto Prison Farms, located at Dabagi, and Experimental stations of the Faculties of Agriculture and Veterinary Medicine, UDU, Sokoto; and within the households of Sokoto metropolis and environs. The system of management and age of each goat was estimated by dental examination (FAO, 1994). On each sampling day, faeces samples collected were screened for *Eimeria* oocysts by a modified direct faecal smear method that facilitate detection via homogenizing about a grain size of faeces in 1 to 3 drops of saturated sodium chloride solution on a clean glass slide and allowing it to stand for about two minutes for oocysts to float underneath the cover slip before scanning through the slide systematically in parallel swipes at 100X microscope magnification. When no *Eimeria* oocysts are found in three preparations, the sample is considered negative for the infection (Foreyt, 2001).

Data Analysis

Data was stored and analyzed in the software Microsoft Excel® 2003. Descriptive statistics was used to explore the prevalence overall and across the variables of interest via cross tabulation. Prevalence of coccidial infection was calculated using the formula, prevalence (%) = total number of animal infected ÷ total number of animals sampled (Thrusfield, 2005). Age of the goats was categorized in two levels with < 1 year regarded as young and ≥ 1 year as adult.

III. Result

Very high (98.9%) overall prevalence of *Eimeria* infection was observed for the Red Sokoto goats. The prevalence of *Eimeria* infection among Red Sokoto goats and systems of management from five locations of Sokoto is presented in Table 1. The findings (Table 1) showed that only one goat (1.1%) from the Experimental station of Faculty Veterinary Medicine, UDU was not shedding *Eimeria* oocysts.

Table 1: Prevalence of coccidial infection by systems of management of Red Sokoto goat in five locations of Sokoto state

Location	Management system	No. of Red Sokoto goats		
		Examined	Infected	% positive
Sokoto Prison Farm, Dabagi	Semi-intensive	6	6	100
UDU Farm, Dabagi	Semi-intensive	26	26	100
Faculty of Agriculture Experimental Station, Dundaye	Intensive	18	18	100
Faculty of Veterinary Medicine, UDU, Experimental Station, Sokoto	Intensive	14	13	92.9
Sokoto and Environs	Extensive	25	25	100

P> 0.05

Table 2 shows the prevalence of *Eimeria* infection in relation to age of the goats which were both high. The prevalence among young was slightly lower than in adult goats.

Table 2: Prevalence of *Eimeria* infections in Red Sokoto goats by Age

Age Group	No. Examined	No. Positive	% Positive
Young	35	34	97
Adults	54	54	100

Table 3 depicts the prevalence of *Eimeria* infection in relation to sex. The female goats had slightly higher infection rate than in the males.

Table 3: Prevalence of *Eimeria* infections in Red Sokoto goats by Sex

Sex	No. Examined	No. Positive	% Positive
Males	35	34	97
Females	54	54	100

IV. Discussion

The results obtained from this study show that *Eimeria* infection is widespread and common in goats in the surveyed area of Sokoto under intensive, semi-intensive and extensive systems of management. This finding agrees with the report that coccidian (*Eimeria*) are ubiquitous in goats in many parts of the world (Lima, 1980a). Kusiluka and Kambarage (1996) observe that system of management is considered as major factor for goat coccidia infection. The similarities in infection rate of male and female goats may suggest similarities in susceptibility and exposure to infection. This observation was previously made by Fabiyi and Bawa (1995) on *Eimeria* infection in large ruminants in Bauchi, Nigeria. There were also similarities in prevalence between young and adults, which indicates that once affected, animals may remain infected for life since it is difficult to eliminate the parasites from the environment (Levine, 1985). This may be attributed to high reproductive potentials, relatively short pre-patent period and sporulation time; high resistance of sporulated oocyst to most disinfectants and the easy faecal-oral route contamination associated with these parasites (Taylor *et al.*, 2015).

Apparently, little attention has been given to *Eimeria* infection parasites of Red Sokoto goats in Nigeria; this study is probably the first documentation on prevalence of the coccidian parasites of the goats breed in the extreme North-western part of Nigeria. Other investigations in Nigeria include a survey of gastrointestinal parasites in sheep and goats of South-eastern Nigeria by Anene *et al* (1994). They found coccidian oocysts in 46.6 percent of the faecal samples examined. Woji *et al* (1994) reported a prevalence rate of 87 percent in West African Dwarf goats in the sub-humid zones of Nigeria; Adefolabi and Chiejina (1987) reported 100% prevalence among adult small ruminants at Nsukka, South-eastern Nigeria.

In other parts of the world, the prevalence varies widely (26.3 to 100%) for coccidial infection among domestic goats. These include, 26.3% of 76 communal goats from semi-arid zone of South Africa (Mpofu *et al.*, 2020); 97.3% of 568 dairy goats in Shaanxi province, northwestern China (Zhao *et al.*, 2012); 91.2% of 215 dairy goats at Sobral State of Ceará, Northeast Brazil (Cavalcante *et al.*, 2012); 89.2% of 287 goats from farms in Terengganu, Malaysia (Yusof and Md Isa 2016); 98% in England (Norton, 1986); 96.3% of kids (young), 94.5% of weaned but unbred goats, 65.5% of older goats (Borgsteede and Derckesen, 1996) in the Netherlands; and 66% of kids (young) and 49% of adult goats in Jordan (Abo-Shehada and Abo-Farieha, 2003). From USA (Lima, 1980b), Australia (O' Callaghan, 1986), the Czech Republic (Koudela and Boková, 1998), Poland (Balicka-Ramisiz, 1999) and Turkey (Değer *et al.*, 2003) infection rates were 100, 97, 92, 81, and 73.6% respectively.

The similarities and variations in overall and factor level prevalence observed in this and other studies could be considered as multifactorial with interactions between biotic and abiotic ecological variables that need further elucidation (Khodakaram-Tafti and Hashemnia, 2017).

V. Conclusion

In conclusion, this study indicated that there is a very high prevalence of *Eimeria* infection among Red Sokoto goats in Sokoto as observed in other breeds and countries of the world. It is therefore, recommended that a detailed epidemiological study of caprine coccidian and coccidiosis covering a longer period and wider geographical area in North-Western Nigeria should be undertaken in order to determine the pattern of the disease and develop appropriate control measures to enhance Red Sokoto goat production and to determine relative economic importance of coccidiosis to the goat production industry in Nigeria.

References

- [1]. Abo-Shehada MN and HA Abo-Farieha 2003. Prevalence of *Eimeria* Species Among Goats in Northern Jordan. *Small Ruminant Research*, 49: 109-113.
- [2]. Adefolabi TK and SN Chiejina 1987. The Faecal Coccidial Oocyst Output of Adult Small Ruminants in Nigeria. *Nigerian Veterinary Journal*, 16(1 & 2): 1-6.
- [3]. Adelana SMA, PI Olasehinde and P Vrbka 2003. Isotope and Geochemical Characterization of Surface and Subsurface Waters in the Semi-arid Sokoto Basin, Nigeria. *African Journal of Science and Technology*, 4(2): 80-89.
- [4]. Anene BM, EO Onyekwodiri AB Chime and SM Anika 1994. Gastrointestinal Parasites in Sheep and Goats of South-eastern Nigeria. *Small Ruminant Research*, 13: 187-192.
- [5]. Anon. 2004. *Metrological Report*. Metrological Unit, Nigeria Airport Authority, Sokoto.
- [6]. Balicka-Ramisiz A 1999. Studies on Coccidiosis in Goats in Poland. *Veterinary Parasitology*, 81: 347-349.

- [7]. Borgsteede FHM and DP Dercksen 1996. Coccidial and Helminth Infections in Goats Kept Indoors in the Netherlands. *Veterinary Parasitology*, 61: 321-326.
- [8]. Cavalcante AC, M Teixeira JP Monteiro and CW Lopes 2012. *Eimeria* species in dairy goats in Brazil. *Veterinary Parasitology*. 183(3-4):356-8.
- [9]. Değer S, A Gül E Ayaz and K Biçek 2003. The Prevalence of *Eimeria* species in goats in Van. *Turkish Journal of Veterinary and Animal Sciences*, 27: 439-442.
- [10]. Fabiyi JP and HB Bawa 1995. *Eimeria* Infections of Cattle in Bauchi, Nigeria. *Nigerian Journal of Parasitology*, 16: 65-71.
- [11]. FAO 1994. A Manual for the Primary Animal Health Care Worker. Food and Agricultural Organization of the United Nations, Rome, Pp 317.
- [12]. FAOSTAT (2020). <http://www.fao.org/faostat/en/#data/QA> Accessed on 8th October, 2020.
- [13]. Foreyt WJ 1990. Coccidiosis and Cryptosporidiosis in Sheep and Goats. *Veterinary Clinics of North America: Food Animal Practice*, 6: 655-669.
- [14]. Foreyt WJ 2001. *Veterinary Parasitology: Reference Manual*. 5th ed. Iowa State University Press, Ames. 235p.
- [15]. Khodakaram-Tafti A. and M. Hashemnia 2017. An overview of intestinal coccidiosis in sheep and goats. *Revue de Médecine Vétérinaire*, 167 (1-2): 9-20.
- [16]. Koudela B and A Boková 1998. Coccidiosis in Goats in the Czech Republic. *Veterinary Parasitology*, 76: 261-267.
- [17]. Kusiluka LJM and DM Kambarage 1996. Diseases of Small Ruminants A Handbook. Common Diseases of Sheep and Goats in Sub-Saharan Africa. VETAID, Centre for Tropical Veterinary Medicine, Scotland.
- [18]. Levine ND 1985. *Veterinary Protozoology*. 1st edition. Iowa State University Press, Ames.
- [19]. Lima JD 1980a. Prevalence of Coccidia in Domestic Goats from Illinois, Missouri and Wisconsin. *International Goat and Sheep Research*, 1(3): 234-241.
- [20]. Lima JD 1980b. *Eimeria caprovina* sp. n. from the Domestic Goat, *Capra hircus* from the U.S.A., *Journal of Protozoology*, 27(2): 153-154.
- [21]. Majaro DM and OO Dipeolu 1981. The Seasonal Incidence of Coccidial Infections in Trade Cattle, Sheep and Goats in Nigeria. *Veterinary Quarterly*, 3: 85-90.
- [22]. Mpofo TJ, KA Nephawe and B Mtileni 2020. Prevalence of gastrointestinal parasites in communal goats from different agro-ecological zones of South Africa, *Veterinary World*, 13(1): 26-32.
- [23]. Norton CC 1986. Coccidia of the Domestic Goat, *Capra hircus*, with notes on *Eimeria ovinoidalis* and *E. bakuensis* (syn. *E. ovina*) from the Sheep, *Ovis aries*. *Parasitology*, 92: 279-289.
- [24]. O'Callaghan MG 1989. Coccidia of Domestic and Feral Goats in South Australia. *Veterinary Parasitology*, 30: 267-272.
- [25]. Opoku-Pare GA and CN Chineme 1979. Pathology of Acute Coccidiosis in Young Goats. *Bulletin of Animal Health and Production in Africa*, 27: 269-273.
- [26]. RIM 1992. Nigeria Livestock Resources. Vol. III: State Reports. Resource Inventory and Management Ltd, London.
- [27]. Taylor MA, RL Coop and RL Wall 2015. *Veterinary Parasitology*, 4th Edition. ed., Hoboken: Wiley-Blackwell, 1032 p.
- [28]. Thrusfield M 2005. *Veterinary Epidemiology*, 3rd edition. Blackwell Science Ltd., Oxford, UK.
- [29]. Wilson RT 1991. Small Ruminant Production and the Small Ruminant Genetic Resource in Tropical, Africa. FAO Animal Production and Health Paper 88. Food and Agricultural Organization of the United Nations, Rome, Pp 181.
- [30]. Woji AY, DA Little and OA Ikwuegbu 1994. Prevalence of Coccidial Infections in the West African Dwarf Goats in the Sub-humid Zone of Nigeria. *Tropical Animal Health and Production*, 26(1): 1-6.
- [31]. Yusof AM and ML Md Isa 2016. Prevalence of gastrointestinal nematodiasis and coccidiosis in goats from three selected farms in Terengganu, Malaysia. *Asian Pacific Journal of Tropical Biomedicine* 6(9): 735-739.
- [32]. Zhao GH, LH Lei CC Shang M Gao YQ Zhao CX Chen and DK Chen 2012. High prevalence of *Eimeria* infection in dairy goats in Shaanxi province, northwestern China. *Tropical Animal Health and Production*. 44(5): 943-6.

Abubakar I.A, et. al. "High Prevalence of Eimeria Infection in Red Sokoto Goats in Sokoto, Nigeria." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 13(11), 2020, pp. 57-60.