Sjournals
Scientific Journals
Scientific Journal of Veterinary Advances (2013) 2(6) 76-82
ISSN 2322-1879

Contents lists available at Sjournals
Scientific Journal of Veterinary advances
Journal homepage: www.Sjournals.com

Original article

Prevalence of giardiasis in cattle slaughtered in Sokoto metropolitan abattoir, Sokoto, Nigeria

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ARTICLE INFO

Article history:
Received 25 May 2013
Accepted 07 June 2013
Available online 28 June 2013

Keywords:
Abattoir
Breed
Cattle
Giardiasis
Nigeria
Prevalence
Slaughter
Sokoto

ABSTRACT

The prevalence of Giardiasis in cattle slaughtered in the Sokoto metropolitan abattoir was investigated. Faeces and bile samples were collected and processed using formal-ether concentration technique. The essence of this study was to establish the prevalence of Giardiasis in Sokoto metropolitan abattoir. Gross lesions from 224 out of 1, 313 slaughtered cattle were randomly selected and examined. Out of the 224 cattle examined, 56 (25.00%) were infected. Out of the 95 male cattle examined, 20 (21.05%) were infected, out of 129 female cattle examined, 36 (27.91%) were infected. The infection with *Giardia spp* in the examined breed was also found to be 56 (25.00%) in relation to breed out of 100 Sokoto Gudali breed examined, 20 (20.00%) were infected, and out of 123 Red Bororo breed examined, 36 (29.27%) were infected. While 1 white Fulani breed was examined, and 0 (0.00%) was infected. The overall prevalence of infection with Giardia was 27.68% and there was a significant difference ($p > 0.05$) between the rate of infection in males and females and between breeds. Regular treatment of all animals and humans with an effective antiprotozoal drugs such as Metronidazole (Flagyl®), Tindamax® (Tinidazole), proper abattoir inspection, adequate and clean water supply to animals; payment of compensation by government, and public enlightenment about the disease by government non- governmental organizations (NGO's) on health implication inherent in unsafe disposal of human and animal

faeces were suggested.This strategy will help to protect animals and the general public from Giardiasis in our country.

1. Introduction

Giardiasis is an intestinal infection caused by a flagellate parasite known as Giardia lamblia (G.Lamblia) which is a one celled microscopic organism (Gupte S., 1996, Aucott J., 2001, Yakubu A.M., 2007). The most common symptoms of infection include foul-smelling explosive diarrhoe, abdominal pain, flatulence, belching, bloating, malabsorption, vomiting and weight loss, nausea and anorexia, mild fever and chills may occur. If left untreated, symptoms may persist for months. The species of the organism are: *Giardia lamblia, intestinalis* and *duodenalis*. For *G. duodenalis*, seven *G. duodenalis* assemblages (A to G) are defined based on genetic analysis and host specificity. More recently, assemblage H has been identified in marine vertebrates (Lasek-Nesselquist E, Welch DM, Sogin ML 2010). Among which, only assemblages A and B are human pathogens and assemblage A is further classified into two major subtypes, AI and AII. Many subtypes are present in the assemblage B due to its high degree of genetic polymorphism. In contrast, assemblages C to G are mostly found in livestock, companion animals and rodents (Xiao L, Fayer R. 2008; Monis PT et al., Sulaiman IM. et al., 2003; Sprong H, 2009). Previously, most studies focused on the prevalence and molecular identification of *G. duodenalis* in livestock and wild animals. Thus far, only one *G. duodenalis* isolate from a rabbit has been identified as assemblage B based on TPI gene (Sulaiman IM. et al., 2003).The disease affect both human and animals (Zoonotic). Giardiasis is also a disease of public Health importance and impact adversely on animal health and production.

The disease is worldwide in distribution, with highest prevalence in the tropics and subtropics (Meyer EA. 1990). In developed nations, it occurs where portable water could be contaminated with small amounts of sewage particularly if septic systems are built too close to water supply (Cutting WAM., 1991 Chalupka S., 2005). The transmission of the cyst of G. lamblia could occur from person to person or by faeco-oral route, but commonly by contaminated drinking water and food. Infrequently transmission can occur in humans by recreational activities involving contaminated water like during swimming (Thompson RCA., 2001). In the United States, Giardiasis is the most common pathogenic intestinal protozoa diagnosed, particularly in campers and hikers or swimmers in public swimming pools from drinking contaminated water, in children in day care centres, and in homosexual males (www.tindamax.com). Other persons at risk include close contacts of infected persons or those who have contact with infected animals. Important sources of infection appear to be adult cows, mechanical vectors and calves themselves.

Despite the high prevalence of Giardia spp. in dairy cattle <6 months of age, the factors that predispose dairy animals to become infected with Giardia spp. are not fully known. Articles have been published reporting the occurrence of the disease in both human and animals throughout the world. Giardia and Cryptosporidium from cattle are potential zoonotic pathogens, and contact with animal's manure or contaminated water is thought to lead to infections in humans. As reports of the common occurrence of Giardia and Cryptosporidium in cattle have increased, so has concern as to the role of cattle as the source of waterborne outbreaks of giardiasis and cryptosporidiosis (Thompson RCA). Isolated studies have reported Giardiasis in cattle and sheep in Africa, Europe and North America, an extensive study of the prevalence of the disease in domestic ruminants has never been reported (Reitmeyer M and Robertson S., 1997).

The prevalence of G. intestinalis infections was determined in Western Canadian and Western Australian dairy calves (OÕHandley et al., 1999), Fifty eight percent of Western Australian calves and 57% of Western Canadian calves were positive for Giardia. In various districts of Switzerland, 815 calves were selected randomly for a single coprological examination for Giardiasis (Taminelli V. and Eckert J. 1989). On average 26.6% of the calves excreted Giardia cysts. They postulated that Giardia infections were frequent and geographically widely distributed in calves and lambs in Switzerland. In Canada, calves were sampled from 505 dairy farms, 45.7% of the farms were positive for Giardia spp. (Ruest, N., Faubert, G.M., Couture, Y. 1998).In another study in Canada; faecal samples were collected from beef calves aged 2Ð10 weeks at 9 farms in Alberta. Samples were examined for the presence of G. duodenalis cysts by immunofluorescent staining. Giardia cysts were found in 168 of the 495 faecal samples

examined, with prevalence ranging from 7% to 60% among the farms (Appelbee, A.J., et al., 2003). In the USA, to determine the prevalence of Giardia genotypes in pre-weaned dairy calves, faecal samples were collected from a minimum of eighteen, 1Ð7-weekold dairy calves per farm on 2 farms each in the states of Vermont, New York, Pennsylvania, Maryland, Virginia, North Carolina, and Florida. Prevalence ranged from 9% on a farm in Pennsylvania to 93% on a farm in Vermont, with an average prevalence for 407 calves on 14 farms of 40% (Trout, J.M., et al., 2004). The prevalence of these parasites in cattle at different 30 farms in Sivas, Turkey, (in cows and calves) was 1.4% and 4.1%, respectively. The prevalence of Giardiasis in the selected dairy cattle was 31.11% (224/720) by PCR, which is similar to the findings of Wade et al. (2000) and McAllister et al. (2005), but is high of the 19.1% prevalence in USA (Hoar et al., 2009).

Unfortunately, there is a dearth of information on prevalence of the disease in Africa and Nigeria as most times, the disease is simply reported as gastro-enteritis in animals but few reports on human beings. An increase in the incidence and frequency of the disease in the last few years in the developed world has brought to the fore a now recognized mode of transmission – sexual contact. This in turn has led to giardiasis being classified as a sexually transmitted disease by the Centre for Disease Control and Prevention (CDC) in the United States. This review identifies its occurrence mainly in homosexual populations of the developed world especially in the United States and the possible spread of the disease through the family setting and even heterosexual relationships (Okwute Loretta Ojonoma 2008).

2. Materials and methods

2.1. Study area

The study was conducted in Sokoto state, Nigeria is located between longitude 11^0 30 and 13^0 – 50 East and latitude 40 and 6^0 40 North. The state shares borderswith Niger Republic to the North, Kebbi state to the South, and Zamfara state to the East. Sokoto abattoir serves Sokoto town and neighboring villages with meats.The cattle meant for slaughter were brought to the Sokoto metropolitan abattoir mainly from Illela market neighbouring Niger republic, Achida market, Kara market within Sokoto metropolis and Mafara market in Zamfara State. The breeds of the cattle were mainly Sokoto Gudali and Red Bororo.

2.2. Sample collection

Samples were collected in July 2010, by randomly examining 224 cattle out of 1,313 slaughtered in the abattoir during the period.

Faecal materials were collected into polythene bags directly from the rectum of each of the sampled cattle slaughtered at the Sokoto metropolitan abattoir using gloved hand. Bile was also collected from the gall bladder after opening each of the sampled carcasses. The samples (bile and faeces) per cattle were each placed in polythene bags labeled using masking tape and pen for identification.

The samples were preserved in a refrigerator and were processed later not exceeding 24 hours.

2.3. Sample processing

2.3.1. Faecal sample

Approximately, 2g of faeces was collected and placed into a labeled test tube containing 3mls of distilled water. The faecal sample and the distilled water were strained to give a suspension.

The suspension was strained through a tea strainer into a corresponding cleaned labeled petridish. The filtrate was poured into a corresponding test tube in a test tube rack different from the first one. 1ml of 10% formalin was added using 18-gauge hypodermic needle and syringe into the test tube which was allowed to stand for 5 minutes. 1ml of Diethyl ether was added in the test tube after 5 minutes using different 18-gauge hypodermic needle and syringe. The test tube containing the suspension was then corked. The test tube was then shaken to mix the suspension. The mixed suspension was centrifuged in a centrifugation machine at the rate of 2000 rpm for 8 minutes. The eggs, cysts of the parasites sedimented at the bottom and the faecal debris became separated in a layer between the Diethyl ether and formol water. The supernatant was then decanted leaving few of it with the sediment. Drops (1-2) of the sediment was put on a glass slide and covered with a cover slip and viewed under microscope using x 100 magnification. The photograph (photomicrograph) of the parasite was taken when required.

2.3.2. Bile sample

2 mls of bile was collected using 18-gauge hypodermic needle and syringe from a labeled polythene bags. The bile sample was then poured into a labeled test tube in a test tube rack. 1ml of 10% formalin was added using 18-gauge hypodermic needle and syringe into the bile sample and then allowed to stand for 5 minutes. 1ml of Diethyl ether was then added in the test tube after 5 minutes using a different 18 gauge hypodermic needle and syringe. The test tube containing the solution was then corked. The test tube was shaken to mix the mixture. The solution was then centrifuged in a centrifugation machine at the rate of 2000 rpm for 10 minutes. The eggs or cysts of the parasites sedimented at the bottom of the mixture, while Diethyl-ether with some fat as supernatant. The supernatant was decanted leaving few of it with the sediment. Drops (1 – 2) of the sediment was put on a glass slide and covered with a cover slip and viewed under microscope using x 100 magnification (Cheesbrough, 1998). Photograph (photomicrograph) of the parasites was taken when required.

3. Results

224 cattle were randomly sampled out of a total of 1,313 slaughtered during the period of study. Out of 224 cattle sampled, 56(25.00%) were infected. Out of ninety five (95) of this were males with infection rate of 20 (21.05%), while 129 were females with infection rate of 36 (27.91%) (Table1).

It was also found out that out of the total number of cattle examined, 56 (25.00%) were infected. Out of which 100 breed of Sokoto Gudali were examined and 20 (20.00%) were infected, and out of 123 breed of Red Bororo were examined 36 (29.27%) were found infected. While 1 white Fulani breed was free of the disease (Table 2).

Results for the Statistical analysis performed using a paired T – test to combine between infections in males and females showed that; t= 5.971, P = 0.106.While using a one way ANOVA at C.I of 95% shows P= 0.223 (P >0.05) between Red Bororo and White Fulani breed; between Red Bororo and Sokoto Gudali and between Sokoto Gudali and White Fulani breed.

During the research, some findings were made showing a mixed infection of *Giardia spp* and *Fasciola spp* (Table 3).

Table 1
Prevalence of *Giardia spp* in relation to sex.

Sex	Number of cattle examined	Number of cattle infected	Percentage infected
Male	95	20	21.05%
Female	129	36	27.91%
Total	224	56	25.00%

Table 2
Prevalence of *Giardia spp.* in relation to breeds.

Breed	Number of cattle examined	Number of cattle infected	Percentage infected
Sokoto gudali	100	20	20.00%
Red bororo	123	36	29.27%
White fulani	1	0	0.00%
Total	224	56	25.00%

Table 6
Distribution of *Giardia spp* with *Fasciola spp* in relation to sex

Sex	Number of cattle examined	Number of cattle infected	Percentage infected
Male	95	8	8.42%
Female	129	7	5.43%
Total	224	15	6.70%

Table 7
Distribution of *Giardia spp* with *Fasciola spp* in relation to breeds.

Breed	Number of cattle examined	Number of cattle infected	Percentage infected
Sokoto gudali	100	4	4.00%
Red bororo	123	11	8.94%
White fulani	1	0	0.00%
Total	224	15	6.70%

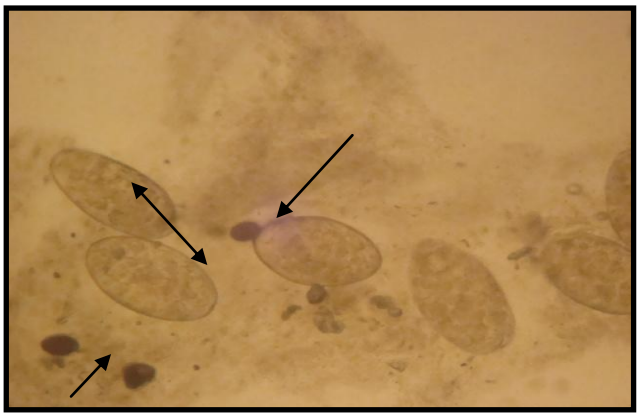

Fig. 1. *Giardia cysts* along with Eggs of *Fasciola spp* from bile sample indicated by the arrows (x100). Double arrow indicates the *Fasciola spp e*ggs.

4. Discussion

The study revealed moderate prevalence of Giardiasis in cattle slaughtered in the Sokoto metropolitan abattoir, Nigeria.

The above data shows that the disease is more common in male than in female and more common in Sokoto Gudali breed than in Red Bororo breed and the white Fulani breed of cattle (more in females than males in giardiasis). We can therefore conclude that generally the rates of infection between breeds occur with significant difference ($p>0.05$). Mixed infections of *Fasciola gigantica* with *Giardia spp* were also found with low prevalence.

This will serve as baseline information on cattle Giardiasis in the northern part of Nigeria. The moderate prevalence of Giardiasis among cattle recorded by this research work compared to some developed countries could be that both sexes (male and female cattle) move together in search of food and water hence exposed to the equal risk of infection; also may be due to poor hygienic condition in farms of our country or due to the method we applied for detection.

In humans, study showed a prevalence rate of 10.1% (9 out of 89) among children with diarrhoea presenting at children's clinic of AGHA (Amaku General Hospital, Awka, Anambra State, Nigeria). This finding is lower when compared with 20-60% documented for developing countries (Reitmeyer M and Robertson S., 1997), but higher than 2-7% reported for developed countries (Reitmeyer M and Robertson S., 1997) where the majority of infections were probably asymptomatic, some being associated with sub-acute or chronic diarrhoea and intestinal irritation (Reitmeyer M and Robertson S., 1997). This eventually contributes to malabsorption and nutritional deficiencies in children (Meadows M. 1999; Dubey R. 2000). This parasite (G. Lamblia) has been noted to be particularly pathogenic for people with immunodeficiency and malnutrition (Meadows M. 1999; Hellard MF. 2000). This prevalence of 10.1% is below the range of 20-60% reported in developing nations is a positive pointer of improving sanitary conditions in the city. A study also showed that 6 months – 4years age group were mostly infected with Giardiasis, which agrees with similar studies done earlier elsewhere (Hill DR. 2005). This is because this age group wear diapers, frequently put their contaminated hands or objects in their mouth and were generally careless about hand washing (Hill DR. 2005). However, the rate of infection among boys was slightly higher than girls in this study, even though the difference is not statistically significant. This could be due to increased involvement in outdoor activities of the boys, which might lead to Giardia transmission. Other pertinent factors

responsible include the presence of asymptomatic carriers in the community who continually litter the environment with cyst stages in their stools as well as the majority of mothers who also continually litter the environment with their children's soiled disposable diapers. Water washed off from soiled floors and clothing, and human faeces thrown into nearby bushes and refuse collection points also encourages transmission. Furthermore, Giardiasis has some Zoonotic implications, since water dwelling animals are known to habour G. Lamblia and can contaminate water more quickly than animal reservoir such as dogs, sheep, cat and cattle that defecate on the ground (Yakubu A.M. 2007).

5. Conclusion

The prevalence of Giardiasis in cattle revealed by this work highlights the infection as being more common in male than female and more common in Sokoto Gudali breed than Red Bororo and White Fulani breed of cattle. Therefore we can generally conclude that there was significant difference between rate of infection in males and females and also the rate of infection between breeds occurs with significant different. Giardiasis is also a disease of public Health importance.

Given the reported prevalence of Giardiasis in Sokoto metropolitan abattoir, a control program in this region appeared justified. The following recommendations are advocated for effective control program. Ministry of Agriculture, Health and agencies at Federal, State and Local Government areas in Nigeria as well as non-governmental organizations (NGO's) involved in providing public enlightenment on health implication inherent in unsafe disposal of human and animal faeces. This strategy will help to protect animals and the general public from Giardiasis in our country.

Treatment of infected animals and humans with effective drugs such as Metronidazole (Flagyl®), Tindamax® (tinidazole) is a well-tolerated, highly effective treatment for giardiasis. Tinidazole's average giardiasis cure rate is 90% (www.tindamax.com). Adequate and clean water supply should be provided to animals. Proper abattoir inspection records should be reviewed annually to provide information on infection level in livestock. Proper meat inspection and payment of compensation by government to the people whose animals or parts were partially or totally condemned should be implemented. It is also recommended that the cattle should be given herd health programmed, since there is an increase in consumption of beef in addition to other purposes (using the products) in Sokoto and Nigeria in general.

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