

Histopathological Lesions of Coccidiosis Natural Infestation in Chickens

ABSTRACT

Coccidiosis is a disease that is caused by protozoan parasite belonging to the subclass coccidia and family Eimeridae, developing within the intestine of most domestic and wild animals and birds. Seven species of *Eimeria* (*E. acervulina*, *E. brunetti*, *E. maxima*, *E. mitis*, *E. necatrix*, *E. praecox* and *E. tenella*) are recognized as infecting chickens. This study is part of the diagnostic investigations carried out to record the incidence of coccidiosis in chickens from different poultry farms sent to Central Diagnostic Laboratory of National veterinary research institute Vom Nigeria for diagnosis. The clinical signs observed include greenish, yellowish, brown bloody stool, inactivity, off feed, weight lost, huddling, drop in feed intake, drop in production, emaciation, comb and wattles pale, anemia and sudden death. Gross lesions include ballooned and haemorrhagic intestine while histopathological lesions revealed loss of epithelial tissue, congestion of blood vessels which indicated disruption followed by leakage of blood, severe mucosal oedema, necrosis of submucosa, loss of villi and marked haemorrhages, presence oocyst within the intestinal villi and lymphoid cells showing hyperplasia. It can be concluded that clinical signs, gross and histopathological examination can be used as a tool for diagnosis of coccidiosis.

Key words: Chickens, Coccidiosis, Histopathology

Introduction

Coccidiosis is a disease that is caused by protozoan parasite belonging to the subclass coccidia and family *Eimeridae*, developing within the intestine of most domestic and wild animals and birds. Seven species of *Eimeria* (*E. acervulina*, *E. brunetti*, *E. maxima*, *E. mitis*, *E. necatrix*, *E. praecox* and *E. tenella*) are recognized as infecting chickens. Although coccidiosis is a disease known for many years, it is still considered as the most economical important parasitic condition affecting poultry production worldwide (Dalloul and Lillehoj, 2006). Coccidia are one

group of protozoa that affect many animal and avian species. Infection by these protozoa lead to severe intestinal disease known as coccidiosis causing weight loss, diarrhoea, ill-thrift and death (McDougald and Reid, 1997; Moses *et al.*, 2015). Avian coccidiosis is classified into caecal and intestinal forms. Caecal coccidiosis is an acute disease characterized by diarrhoea and massive caecal haemorrhages. It is caused by *Eimeria tenella* (Gardinar, 1955; Moses *et al.*, 2015). Similarly, intestinal coccidiosis is caused by *E. necatrix* (Johnson, 1930). Coccidiosis presented an aggregate dispersion pattern and seasonal variations in infestation levels, influenced by the environmental conditions in the rainy season. Variation in the coccidiosis dynamics created overall changes in the bird flocks, characterized by greater diversity, species richness and evenness during the rainy season. There high prevalence of coccidiosis in the rainy seasons than in dry seasons due to wetness of bird pens in lickage roofs (Carvalho, and Tavares- Dias, 2017). The agewise prevalence of coccidiosis was the highest (48%) in the 31-45 days age group and the least (6%) in 0-15 day's age group of layers. The coccidiosis was found highly prevalence in mud/mud+brick type floor than in concrete type floor farms (Adhikari *et al.*, 2008). It has been reported as the most common pathogenic and chronic form occurring in the domestic poultry among all these species. In this form, lesions are distributed throughout the length of the intestine, but, most common in the middle portion of the small intestine. In acute form, severe unclotted blood may be observed. Flocks infected as a result of mild to severe exposure usually shows a marked decrease in food and water consumption and birds become depressed and tend to huddle and weight loss may noticed (Barde *et al.*, 2012). The weight loss may occur as a result of the disruption of the intestinal mucosa where minimal absorption is taking place. The lesion of coccidiosis depends on the degree of inflammation and damage to the intestinal tract resulting in diarrhea and

consequently dehydration. Lesions of the intestinal mucosa and loss of pigmentation may also become apparent during the latter stages of infection (Conaway and McKenzie, 1991; Edgar, 1992; Lillehoj and Trout, 1993; McDougald and Reid, 1997; Moses *et al.*, 2015). Major pathological manifestations of coccidiosis clinically can be observed as haemorrhage, malabsorption, diarrhoea and reduction in body weight gain (Lillekoj and Lillehoj, 2000; Moses *et al.*, 2015).

Due to the difficulties encountered during diagnosis, Coccidiosis is still a major problem worldwide. To; identify different species by the morphology of the oocysts can be challenging and it requires trained personnel (Soulsby, 1982). However, the diagnosis of coccidiosis can be achieved based on clinical signs, coprology and pathomorphological and pathohistological analysis (Long and Joyner, 1984; Conway and Mckenzie, 2007). The significance of the pathological findings is very relevant which is based on the macroscopic and histopathological damages to the intestines. So the aim of this study is to diagnose Coccidiosis using clinical and histopathological approaches.

Materials and method

The findings reported in this study are part of the diagnostic investigations carried out to record the incidence of coccidiosis in poultry chicken from different poultry farms sent to Central Diagnostic Laboratory for diagnosis. Clinical histories and signs were recorded. Postmortem was then conducted and the lesions were recorded and fresh faecal analysis from the intestinal contents were carried out to examine for oocysts and sporozoites using the method described by Adams *et al.*, (1971).

Histopathological procedure

Tissues from intestine and caeca were harvested with the aid of scalpel blade and forceps. Then fixed in 10% neutral buffered formalin solution. They were allowed to fix properly before processing with ascending grades of ethyl alcohol. Then cleared with two changes of xylene. The tissues were then infiltrated in molten paraffin wax and then embedded. Tissue blocks were sectioned at 5microns thickness, stained with Haematoxylin and Eosin (Avwioro 2002).

Heamatoxylin and eosin staining Technique procedure

The sections were hydrated through descending grades of alcohol, stained in Harris Heamatoxylin for 2min rinsed in H₂O, differentiated in 1% acid alcohol briefly, blued in scott's top water for 2min, Counter stained in 1% aqueous eosin for 1min, rinsed in water. The sections were then dehydrated through ascending grades of alcohol, cleared with xylene and mounted in distrene polystyrene xylene (DPX). The slides were then examined with the light microscope and the photomicrographs recorded accordingly.

Results and discussion

Clinical findings

The clinical findings were observed and recorded for all the sick chickens and they include greenish, yellowish, brown bloody stool, inactivity, off feed, weight lost, huddling, drop in feed intake, drop in production emaciation, comb and wattles pale, anemia and sudden death; this is in agreement with previous reports (Lillekoj and Lillehoj, 2000;Gardinar, 1955;)

Post – mortem lesions (gross pathology)

Coccidiosis was determined through demonstration of postmortem lesions recorded in dead birds. The postmortem revealed the lesions of intestinal and caecal forms of coccidiosis.

In case of intestinal form, external ballooned intestine and petechial hemorrhages could be seen while looking grossly without opening the gut which is similar to the findings of (Tyzzer, 1929; Johnson, 1930 and Davies 1963).

In case of caecal coccidiosis, enlargement of caecum with clotted blood, haemorrhages were observed. On opening the caeca, the bloody mass, a characteristic of caecal coccidiosis was found, similar to the reports of (Roillet and Lucet, 1891; Fantham, 1910; Tyzzer, 1929 and Long, 1973; Moses *et al.*, 2015).

Histopathological lesions

Histopathological lesions in case of caecal form revealed loss of epithelial tissue, congestion of blood vessels which indicated disruption followed by leakage of blood, severe mucosal oedema, necrosis of submucosa, loss of villi and marked haemorrhages and lymphoid cells showing hyperplasia. Also, chicken caecum and intestine showing *Eimeria* oocyst (Fig.1).

In case of intestinal forms, lesions were found in the form of complete detachment of the mucosal layer from sub-mucosal layer. Also chicken intestine showing sloughing of the villi and *Eimeria* oocyst, decreased of villa height in addition to cancerous necropsy and fatty decomposition were observed (Fig.2 and 3), this is similar with the reports of previous researchers (Long and Joyner, 1984; Conway and Mckenzie, 2007).

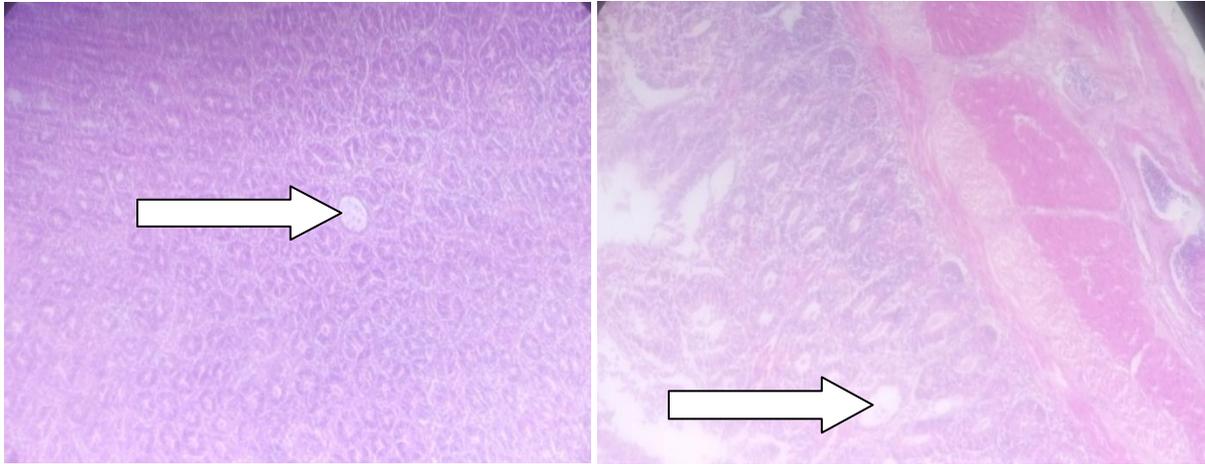


Figure 1: Photomicrograph of chicken caecum and intestine showing *Eimeria* oocyst

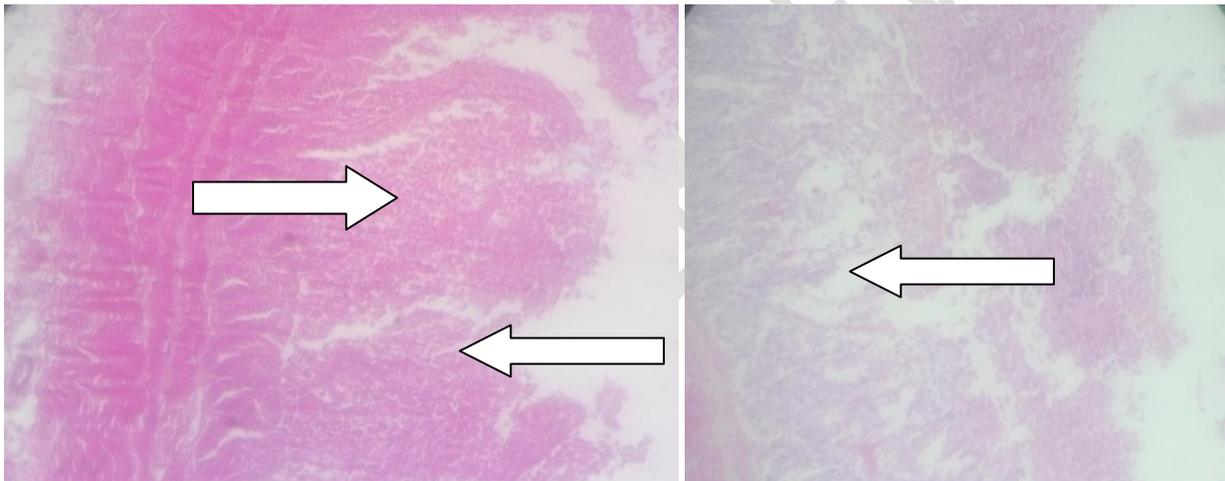


Figure 2: Photomicrograph of chicken intestine showing sloughing of the villi

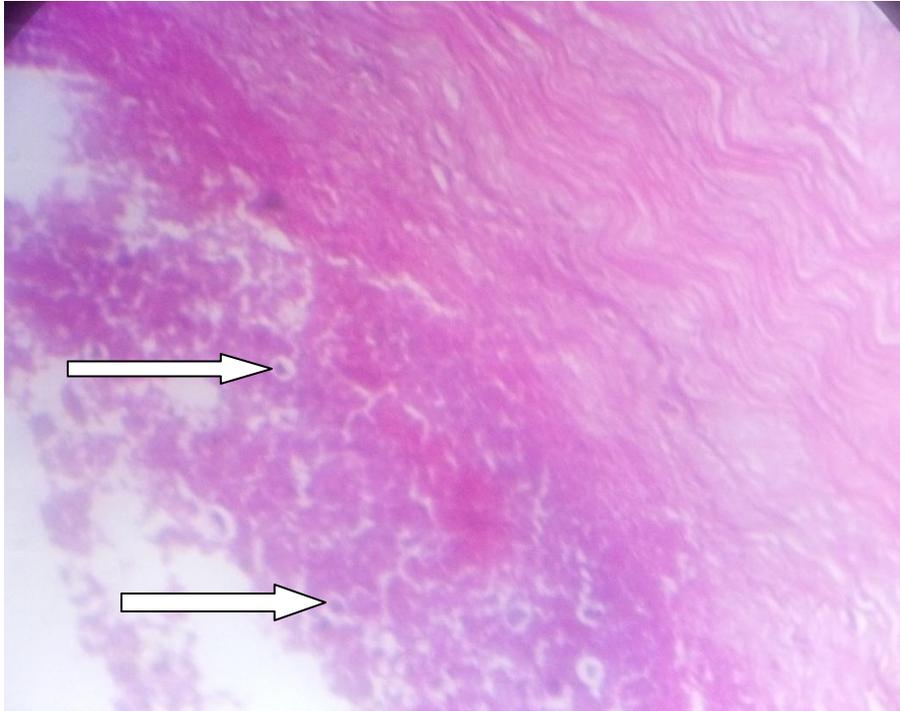


Figure 3: Photomicrograph of chicken intestine showing sloughing of the villi and Eimeria oocyst

Conclusion:

The clinical signs observed include greenish, yellowish, brown bloody stool, inactivity, off feed, weight lost, huddling, drop in feed intake, drop in production, emaciation, comb and wattles pale, anemia and sudden death. Gross lesions include ballooned and haemorrhagic intestine while histopathological lesions revealed loss of epithelial tissue, congestion of blood vessels which indicated disruption followed by leakage of blood, severe mucosal oedema, necrosis of submucosa, loss of villi and marked haemorrhages, presence oocyst within the intestinal villi and lymphoid cells showing hyperplasia. It can be concluded that clinical signs, gross and histopathological examination can be used as a tool for diagnosis of coccidiosis.

Ethical Approval

Animal Ethic committee approval has been taken to carry out this study.

Reference:

Adams, K.M.G, Paul J and Zaman V (1971). Medical and veterinary protozoology an illustrated guide. Church Livingstone, Edinburgh and London. Pp. 170-173.

Adhikari, A., R. Gupta and G. R. Pant (2008). Prevalence and identification of coccidian parasite (*Eimeria* spp) in layer chicken of ratnanagar municipality, chitwan district, Nepal. *Journal of natural history museum*, 23: 45-50

Aviwioro O.G.(2002) Histochemistry and tissue pathology. Principles and techniques.1th Edition ISBN 978-35627-9-7.

. Barde, J.I., Garba,A., Gashua,M.M., Talba,M.A., Gugong, V.T., Saadatu, I., Owada,A.H., Konzing,L., Awulu, S.J and Mohammed, M.N. (2012). Common diseases of poultry in Kaduna State: Perspective of a private clinic Nigerian *Veterinary Journal* 33(3): 583-587.

Carvalho, A. A and M. Tavares- Dias (2017). Diversity of parasites in *Cichlasoma amazonarum* Kullander, 1983 during rainy and dry seasons in eastern Amazon (Brazil). *Journal of applied ichthyology*, 33(6): 1178-1183

Conway, D.P. and M.E. McKenzie.(2007). Poultry Coccidiosis: Diagnostic and Testing Procedures.3rd edition Blackwell Publishing.Ames, IA, USA. 164 pp.

Conway, D.P. and Mckenzie, M.E. (1991): Poultry coccidiosis diagnostic and testing procedures, 2nd Edition, chapter 2:17-36.

Dalloul, R.; Lillehoj, H.(2006)Poultry coccidiosis: recent advancements in control measures and vaccine development. *Experimental Review of Vaccines.*, 5:143-163.

Davies, S.F.M.(1963). *Eimeria brunetti* and additional cause of intestinal coccidiosis in domestic fowl British. *Veterinary Records.*, 75: 1-4.

Edgar, S. A. (1992): Field diagnosis of coccidiosis in chickens. Agri-Bio Corporation. 42-58

Fantham, H.B.(1910). The morphology and life-history of *Eimeria* (*Coccidium*) *avium*: a protozoon causing a fatal disease among young groups. *Proc. Zool. Soc. London*, pp: 672-91.

Gardinar, J.L.(1955). Severity of caecal coccidiosis infection in chicken as related to the age of host and number of oocyst ingested. *Journal of Poultry Science*34: 515-20.

Johnson, W.T.(1930). A study on *Eimeria necatrix*. *Agriculture Experimental Station*538 30-33.

Lillehoj, H. S. and Trout, J. M. (1993): Coccidia: A review of recent advances on immunity and vaccine development. *Avian Pathology journal* 22:3-31.

- Lillehoj, H.S. and Lillehoj, E.P.(2000). Avian coccidiosis. A review of acquired intestinal immunity and vaccination strategies. *Avian Diseases*, 32: 408–425.
- Long, P.L. and L.P. Joyner. (1984). Problems in the identification of species of *Eimeria*. *Journal of Protozoology*31: 535–41.
- Long, P.L.(1973). *Pathology and Pathogenicity of Coccidial Infection*, University Park Press, Baltimore, Maryland. pp: 251–94.
- McDougald L.R. Reid W.M.(1997). Coccidiosis, Diseases of Poultry 10th edn, Calnek B.W., Barnes H.J., Beard C.W., McDougald &. L.R., Saif Y.M. (eds), Iowa State University Press: Ames, IA ,865- 883
- Moses, Gyang Davou, Kumbish, P. R., Barde, I. J., Ahmed J. S. Olabode H. O. K. and Wungak Y. S. (2015). A Retrospective Study on Chicken Coccidiosis in Ilorin, Kwara State, Nigeria Direct Research Journal of Agriculture and Food Science , 3 (5): 93-97
- Raillet, F. and M. Lucet.(1891). An account of coccidiosis in the domestic fowl. *England Veterinary Journal of Medicine*, Vol. II: 661–2
- Soulsby,E. J. L. (1982). Helminth, Arthropods and Protozoa of Domesticated Animals, Bailliere Tindall Press, London, UK, 37-56
- Tyzzer, E.E. (1929). Coccidiosis in gallinaceous birds. *American Journal of Hygiene*, 32: 269–383.