

Pathology of Naturally Occurring Intestinal Coccidiosis of Small Ruminants reared in Kashmir, India

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ABSTRACT

The economical rearing of small ruminants both sheep and goat is severely hampered by endoparasites including gastrointestinal nematodes and protozoan parasites. Among protozoan parasites Eimeria ovinoidalis is the most pathogenic species responsible for producing coccidiosis in small ruminants and pose a significant threat to the meat industry by causing huge economic losses as clinical disease. The present work reports coccidiosis in different sheep and goat farms in Kashmir valley. In a period of four months more than fifty animals showed clinical signs of the disease which included diarrhoea with foul smell, smudging of perineum, anaemia with pallor of conjunctival and gingival mucous membranes, recumbency, unsteady gait, inability to keep head high, rough hair coat, loss of appetite and decreased body weight. The gross pathological changes observed during necropsy were thickening of intestinal mucosa and nodular lesions of the small intestine particularly jejunum and ileum. Microscopically, the intestine revealed schizonts, necrosis, destruction of crypts, desquamation of villi and infiltration of lymphocytes, plasma cells and eosinophils. The disease diagnosis was based on history, symptoms, lesions and presence of heavy coccidial oocyst on faecal microscopy. In conclusion, this study showed no differences between sheep and goat cases with regards to clinical signs, gross and histopathologic lesions.

Keywords: Coccidiosis, small ruminants, eimeria, nodules, cellular infiltration outbreak, Kashmir valley

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INTRODUCTION

Coccidiosis is one of the economically most significant parasitic infection menacing sheep and goat industry worldwide [14]. It is caused by protozoan parasites of genus Eimeria, of which around 13 species have been described in goats in different parts of the world with several of them being pathogenic [15]. The parasite affects almost all young sheep and goats in their early life within first 6 months [2]. The economic losses due to the disease, clinical and subclinical or chronic, are huge owing to decreased growth performance, mortality, morbidity and costs incurred for prophylactic and therapeutic management [4].

The disease is characterized by damage to the gut leading to enteritis which can be hemorrhagic in Ruminants [6]. It has been observed that the diarrhea in goat kids is usually not bloody but it contains blood and mucus and may be very watery [17]. The coccidiosis in small ruminants develop severe anaemia characterized by pale mucous membranes [2]. The damage to the intestinal cells due to the invasion of parasite causes loss of electrolytes and

malabsorption causing rapid loss of body condition and eventual death if not properly managed [10].

Because of the huge economic impact of this disease, its pathological effect in small ruminants of Kashmir valley was studied.

MATERIAL AND METHODS

The present study was conducted on mortalities occurring in small ruminants farms operating in Ganderbal district of Kashmir as well as those brought to Division of Veterinary Pathology, F.V.Sc. and A.H, SKUAST-K for post mortem examination. A total number of 60 tissue samples from abomasum, small intestines and large intestines were collected during the time of necropsy. The carcasses were subjected to systematic necropsy examination. Organs were thoroughly examined on the basis of clinical conditions and gross pathological examination. Tissue samples of various organs collected in 10% buffered formalin was subjected to routine histopathological examination and processed by routine paraffin embedding technique. The sections were stained with Harris haematoxylin and eosin technique for observation of pathomorphological changes observed in the tissues.

RESULTS

Clinical Signs

Subclinical coccidiosis in small ruminants may show poor growth, weight loss, reduced feed intake and loss of faecal pellet formation. There may be severe blood loss in the intestinal lumen seen in small ruminants which is responsible for the sudden causation of death. In some cases early signs may include decreased appetite, listlessness, weakness and abdominal pain that may be manifested by crying and frequent rising up and lying down. There may be watery yellowish diarrhoea seen in the affected animals. In addition to this inappetance, debility, loss of weight, rough hair coat, dehydration, anaemia and persistent straining pass faeces are the common features associated with coccidiosis. In severe cases there may be fever, ocular and nasal discharge, bloody diarrhoea as a result of extensive damage to the gut epithelium.

Gross lesions

The gross and microscopic lesions are shown in Fig 1-6. Grossly signs of enteritis may range from catarrhal to haemorrhagic in nature. The intestinal lumen may contain fresh blood with oedema and thickening of the intestinal wall. The most consistent and characteristic lesion is the occurrence of multiple white nodules seen on the intestinal mucosa. These nodules are averaged 2-3 mm in diameter and could occasionally be seen through the serosal surface before the lumen was opened. The advanced cases had adenomatous swelling in mucosa and gyrate pattern on the serosal surface. The postmortem examination of some animals revealed liquid faecal material adhered to the hair around the anus. The entire affected part of mucosa were thickened due to mucosal hypertrophy and adenomatous-like changes and depressions on the serosal surface of the intestine. At necropsy of goats, gross lesions were seen mostly in the jejunum, ileum, cecum, and sometimes in proximal colon. Fifteen cases had minimal lesions including a few scattered whitish non-pedunculated to pedunculated nodules on the mucosa of the jejunum and ileum. Few advanced cases revealed marked lesions including adenomatous-like mucosa and numerous small whitish non-pedunculated nodules on the mucosa of the jejunum, ileum, cecum and proximal colon

Histopathology

The histopathological lesions found in sheep and goats are shown in Fig. 7-12. On histopathological examination, abomasum of goat infected with coccidiosis showed schizonts, haemorrhage and destruction of crypts with mononuclear cell infiltration. The main histopathological lesion of coccidiosis is hyperplastic or proliferative enteritis. The Jejunum of animal showed circular structures of developmental stages of *Eimeria* with destruction of mucosal epithelial cell layers, necrosis, fusion and stunting of villi. Moreover there may be decreased lymphocytes in the medulla and cortex with necrosis of villi and severe infiltration of mononuclear cells were noticed in jejunum. The other findings may include lymphoid cells hyperplasia, blunting of intestinal villi and inflammatory cell infiltration in the lamina propria with numerous developmental stages of the parasites in the Jejunum. The Ileum of animal showed first generation schizonts, degeneration, necrosis,

destruction of crypts, desquamation of villi and infiltration of lymphocytes, plasma cells and eosinophils. Some cases revealed revealed papillary hyperplasia of the mucosal epithelium with moderate inflammatory reaction with the presence of developmental stages of Eimeria including trophozoites, schizonts and oocysts in the epithelium of affected intestinal villi and crypts. In marked cases, the epithelial cells of hyperplastic crypts and villi of the jejunum, ileum, cecum, and proximal part of colon were full of developmental stages of Eimeria. The giant schizonts were easily discernible in five cases. There was no histologic evidence of presence of developmental stages of Eimeria in the duodenum, distal colon, rectum, submucosal tissues, or mesenteric lymph nodes.



Fig.1 Nodular Enteritis in goat



Fig.2 Thickened mucosa with white raised nodules in sheep



Fig.3 Duodenum of sheep showing nodules



Fig.4 Sheep intestine revealing white raised nodules



Fig.5 Goat intestine revealing congestion & raised nodules

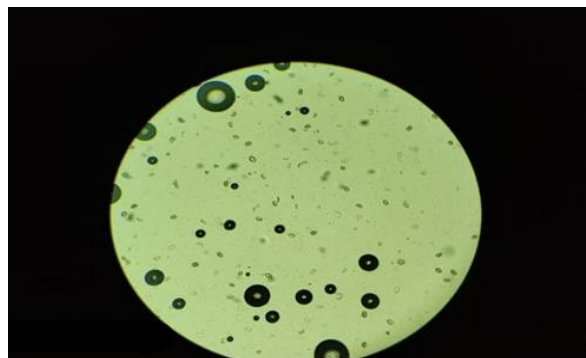


Fig.6 Coccidian oocyst

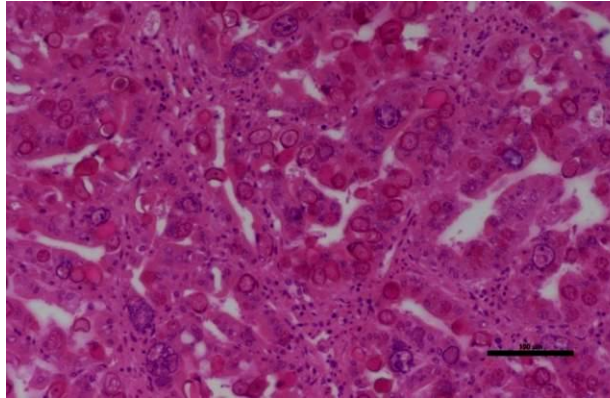


Fig.7 Photomicrograph revealing schizonts in intestinal mucosa

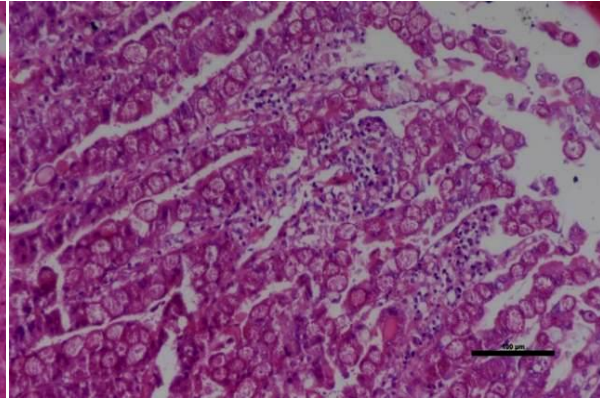


Fig.8 Photomicrograph revealing schizonts with cellular infiltration of eosinophils and neutrophils in ileum

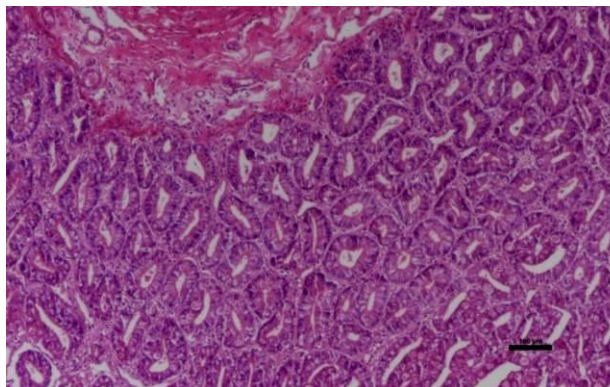


Fig.9 Photomicrograph revealing congestion of mucosa and increased glandular structure in muscularis mucosa

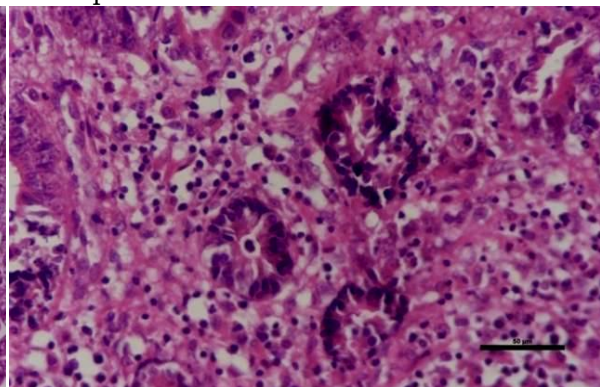


Fig.10 Photomicrograph revealing epithelial vacuolation, cellular infiltration and degenerated glandular epithelium

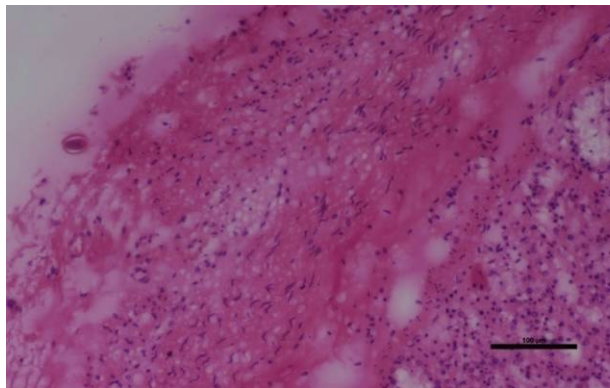


Fig.11 Photomicrograph revealing thickened intestinal mucosa due to marked edema with degenerated epithelial cells

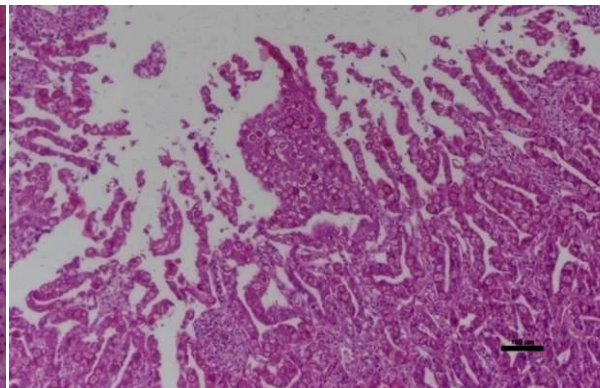


Fig.12 Photomicrograph revealing distorted intestinal villi with load of schizonts

DISCUSSION

Clinical signs

Clinical signs of coccidiosis are due to destruction of the intestinal epithelium and the underlying connective tissue of the mucosa. The affected animal may show the signs of diarrhoea which may be watery and yellowish in colour. In some cases early signs may include decreased appetite, listlessness, weakness and abdominal pain that may be manifested by crying and frequent rising up and lying down. The affected animal may show the signs of discharge of blood, dehydration, fever, in appetite, weight loss, emaciation, and in extreme cases death may occur. [1, 3, 18].

Gross lesions

In small ruminants, the moderate changes are observed as thickening of the intestinal mucosa associated with scattered whitish non-pedunculated nodules. These nodules represent sites of active gametogony and pathomorphological examination of the effected organs with the history must be considered in establishing coccidiosis as cause of disease [5, 13]. The large schizonts of some species are sometimes grossly visible as well [11]. The entire affected part of mucosa were thickened due to mucosal hypertrophy and adenomatous-like changes and depressions on the serosal surface of the intestine. The most common lesions were seen in the jejunum, ileum, and caecum, observed grossly as non-pedunculated whitish nodules [8, 19]. The intestinal contents are mixed with clotted blood, and the mucous coat is mottled with multiple petechial or larger haemorrhages [7].

Histopathology

Although the main histopathological lesion of coccidiosis is hyperplastic or proliferative enteritis with loss of surface epithelial cells, villous atrophy and crypt destruction. Histopathological lesions in case of caecal form revealed loss of epithelial tissue, congestion of blood vessels, oedema, necrosis of submucosa, loss of villi, disruption of caecal mucosa, necrosis of caecal mucosa and lymphoid cells showing hyperplasia [16, 9]. In case of intestinal forms, lesions were found in the form of complete detachment of the mucosal layer from sub-mucosal layer, lymphoid cells hyperplasia, mononuclear cells infiltration was noted in the mucosal layer. The affected Jejunum revealed haemorrhages with whitish spots, inflammation and necrotic patches [12].

CONCLUSION

In conclusion, this study showed no differences between sheep and goat cases with regards to clinical signs, gross and histopathologic lesions. The most common lesions were in the jejunum, ileum, and cecum, grossly as non-pedunculated whitish nodules and microscopically, as proliferative enteritis with presence of developmental stages of the *Eimeria*.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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