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OCCURRENCE AND PATHOLOGICAL STUDY OF INTESTINAL COCCIDIOSIS IN CAMELS (*Camelus dromedarius*) OF WESTERN RAJASTHAN

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ABSTRACT

Present investigation was carried out for occurrence and pathological study of coccidiosis in camels. One hundred seventy two samples of intestine were collected from western Rajasthan irrespective of age, breed and sex during September 2013 to January 2014. Out of these, 103 samples with clear gross lesion, were further subjected to investigation. Gross lesions were hyperaemia and patchy haemorrhages were found in mucosa of intestine. Tissue samples were taken from the intestinal tracts and then fixed in 10% buffered formalin. They were mechanically processed and embedded in paraffin. Sections of 5 µm thickness were cut with help of hand operated microtome and stained with hematoxylin and eosin. Coccidiosis was recorded in 8.74% cases. Microscopic examination revealed eosinophilic enteritis and existence of developmental stages of the parasite such as giant schizonts, microgamont, macrogametocytes, and unsporulatd oocysts in the lacteals of lamina propria and in the epithelium of Lieberkühn glands. Coccidial infection is prevalent in camels in the western Rajasthan.

Key words: Camel, coccidiosis, pathology, western Rajasthan

Coccidiosis is an economically important disease in many species of livestock. Coccidiosis may be seen in camel calves with symptoms like diarrhoea, dysentery, dehydration, rough hair coat, and anaemia (Parsani *et al,* 2008). Performance of camel is drastically reduced by burden of gastrointestinal parasites. Prevalence of nematodes and protozoa were reported previously by Radfar and Aminzadeh Gowhari (2013) in indigenous camel at Iran and nematodes, trematodes, cestodes, and protozoa by Swai *et al* (2011) in northern Tanzania, Mahmuda *et al* (2014) in Sokoto, Nigeria. Coccidia comprise of a large group of obligatory intracellular parasites (Duszynski *et al*, 1999). Mainly *Eimeria* and *Isospora* genera infect camels. *Isospora* was also recognised as a pathogen causing diptheroid-to-haemorrhagic colitis in 4-8 weeks camels by Kinne *et al* (2002). Five *Eimeria* species are considered to have the capability of infecting dromedary camels of which *E. cameli* and *E. dromedari* are considered as major pathogens (Wernery and Kaaden, 2002). All species parasitise the camel's intestine (Boid *et al,* 1986; Lewine and Ivens, 1986; Kaufmann, 1996; Wernery and Kaaden, 2002; Yakhchali and Cheraghi, 2007). Regarding the importance of coccidiosis in camels, different opinions in the literature exist. Severe coccidiosis causing enteritis and a mortality rate up to 10% in young camels have been reported in few cases (Hamanchadran *et al*, 1968; Gruvell and Graber, 1969; Chineme, 1980; Levine, 1985; Hussein *et al*, 1987; Kinne and Wernery, 1997). The purpose of the present research work was to study the gross and histopathological lesions of naturally occurring coccidiosis in camels as well as its occurrence in western Rajasthan.

Materials and Methods

This study was carried out during September 2013 to January 2014. A total of 172 samples of camel intestine were collected irrespective of age, breed and sex. Out of these 103 samples showing gross lesions were collected in 10% formal saline for histopathological examination. The tissue specimen were collected from carcasses of camels subjected to postmortem examination at veterinary hospitals of few districts of western Rajasthan (Bikaner, Jaisalmer, Jodhpur and Barmer) and Teaching Veterinary Clinical Campus of College of Veterinary and Animal Sciences, Bikaner. The tissues were processed mechanically for paraffin embedding (Lillie, 1965) and sections were stained with hematoxylin and eosin (H&E) to conduct histopathological examinations. The identification

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of *Eimeria* species was based on morphometry and morphology of developing stages (Dubey and Pande 1964, Kawasmeh and Elbihari, 1983).

Results

Coccidiosis was recorded in 8.74% (9 out of 103 camels) cases. Mostly gross lesions were seen in the jejunal and ileum part of intestine, and there were variable degree of hyperaemia, oedema and haemorrhages in affected segments (Fig 1). Severe Coccidiosis was confirmed by microscopic findings characterised by numerous coccidia stages in the intestinal mucosa (more than 1 per high-power field in several locations). Degeneration and desquamation of the intestinal epithelium and infiltration of eosinophils in mucosa were seen (Fig 5 and 6). In contrast, a mild coccidia-infection was seen, with only a few coccidia stages and no inflammation of the mucosa was observed. The affected villi and crypts were distended and disorganised due to developmental stages of *Eimeria* species (Fig 6). The developmental stages of *Eimeria* species such as giant schizonts, microgamont, macrogametocytes, and oocysts in the lacteals of lamina propria and in the epithelium of the Lieberkuhn glands were observed (Fig 1, 4, 5, 10 and 14). Early formative schizont with small rings of nuclei and infiltration of eosinophlilic granules were seen in mucosa of jejunum (Fig 3). The giant schizonts were seen mainly in the lamina propria of villi, particularly in the crypts of Lieberkuhn of the jejunum and ileum, affected crypts were disorganised or obliterated due to the growth

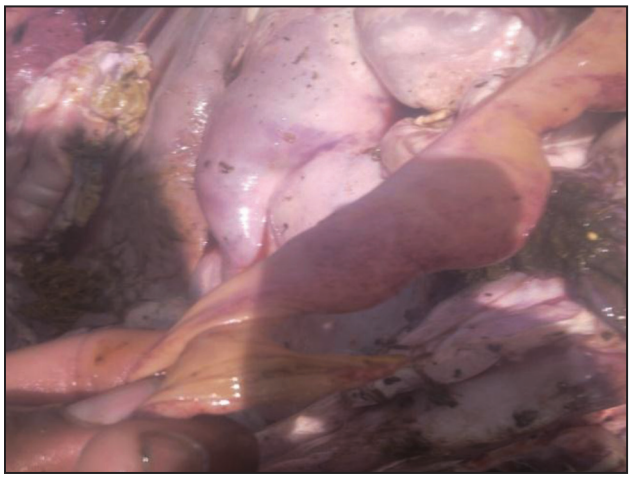

Fig 1. Gross photograph showing congestion and haemorrhages in intestine.

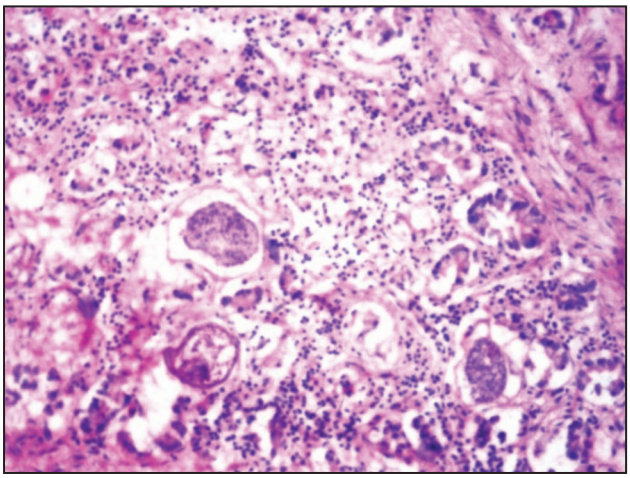

Fig 2. Section of jejunum showing two schizont of *Eimeria cameli* in the early formative stage with small rings of nuclei with infiltration of eosinophilic granulocytes and few macrophages (H & E X200).

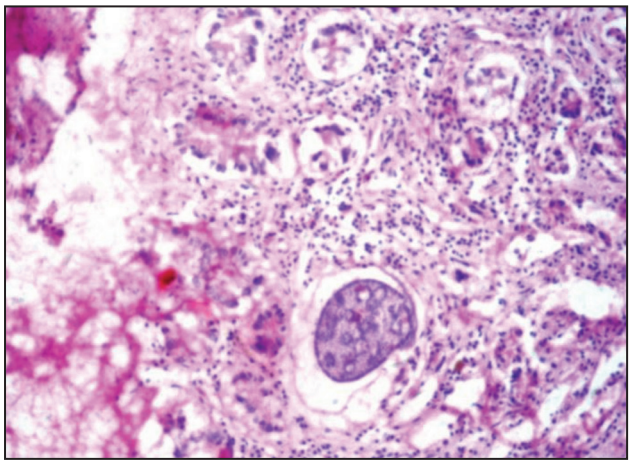

Fig 3. Section of jejunum showing a schizont of *Eimeria cameli* in the early formative stage with small rings of nuclei with infiltration of eosinophilic granulocytes and few macrophages (H & E X200).

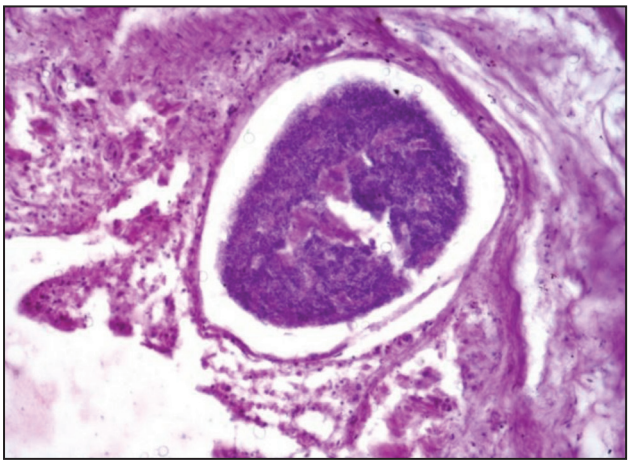

Fig 4. Section of jejunum showing developed large schizont of *E. cameli* containing clumps of merozoites which surround pink staining fluid in the centre, space separating the merozoites from the wall of schizont is a fixation artefact (H & E X200).

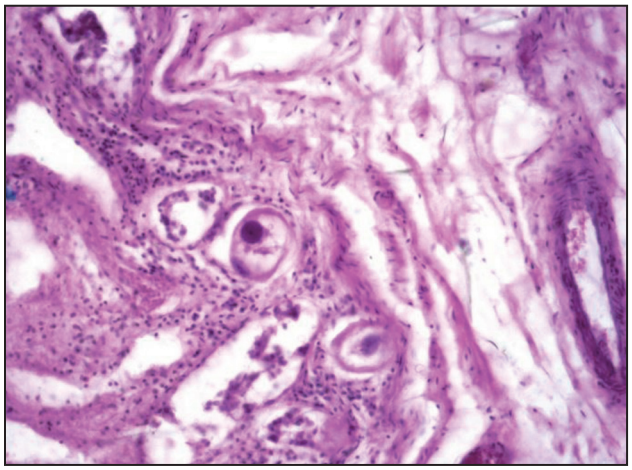

Fig 5. Section of intestine showing macrogametocyte containinig ovum with infitration of eosinophilic granulocytes (H & E X200).

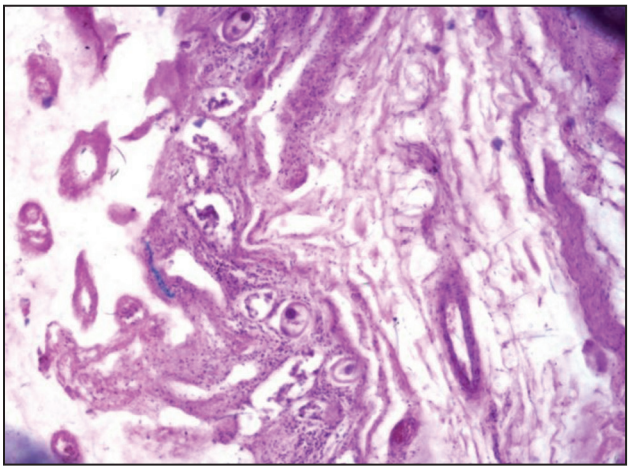

Fig 6. Various developmental stages of *Eimeria* in mucosa of jejunum and degeneration and desquamation of epithelial cells (H & E X100).

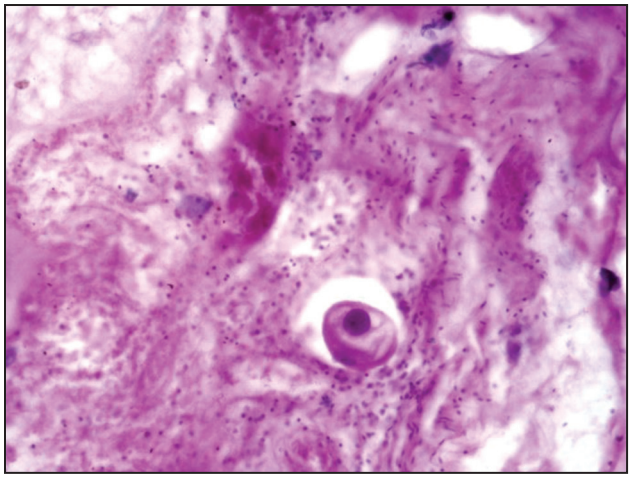

Fig 7. Section of intestine showing macrogametocyte containinig ovum (H & E X200).

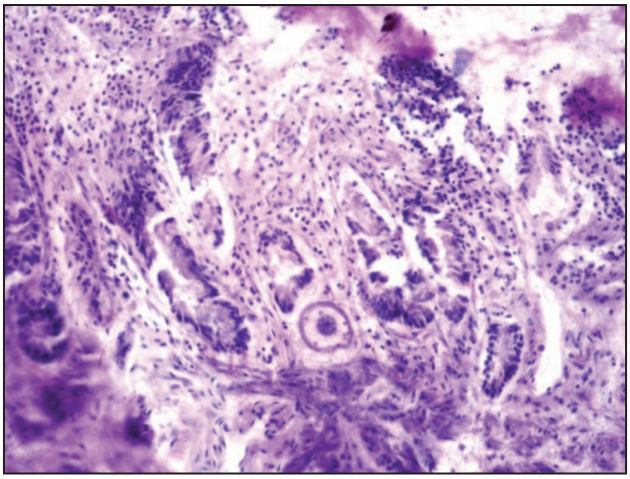

Fig 8. Section of intestine showing developing macrogamont with wall forming bodies at periphery (H & E X200).

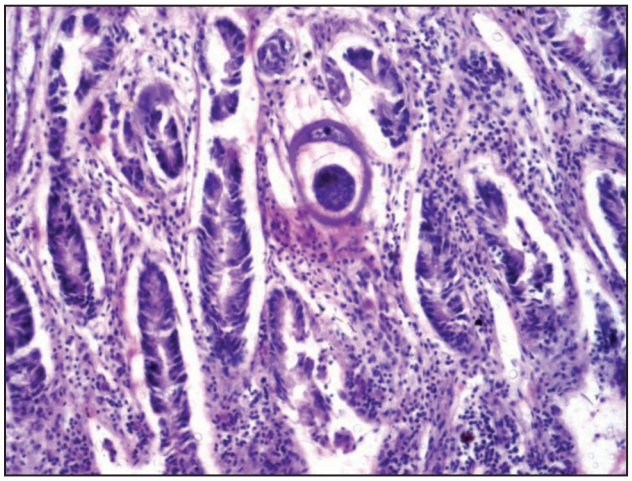

Fig 9. Section of intestine showing developing macrogamont with hypertrophied host cell and its nucleus displacing towards periphery (H & E X200).

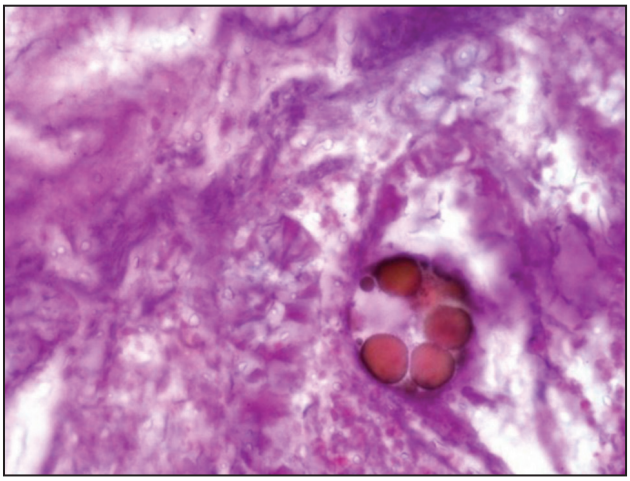

Fig 10. Section of intestine showing devoloping oocyst with wall forming bodies and atrophy of mucosal glands with few eosinophilic granulocytes (H & E X400).

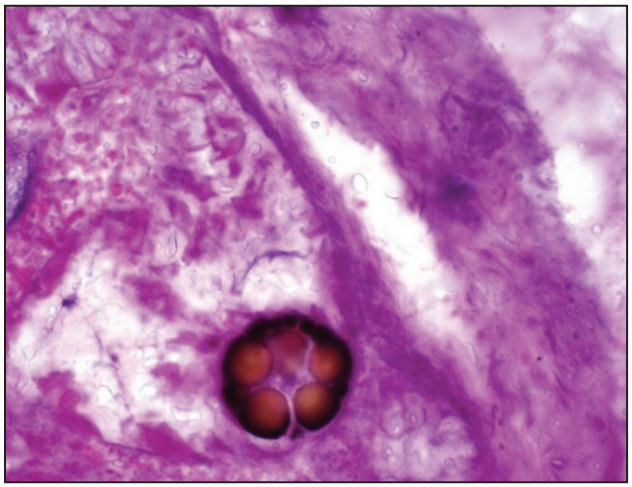

Fig 11. Section of intestine showing devoloping oocyst with wall forming bodies and atrophy of mucosal glands with few eosinophilic granulocytes (H & E X400).

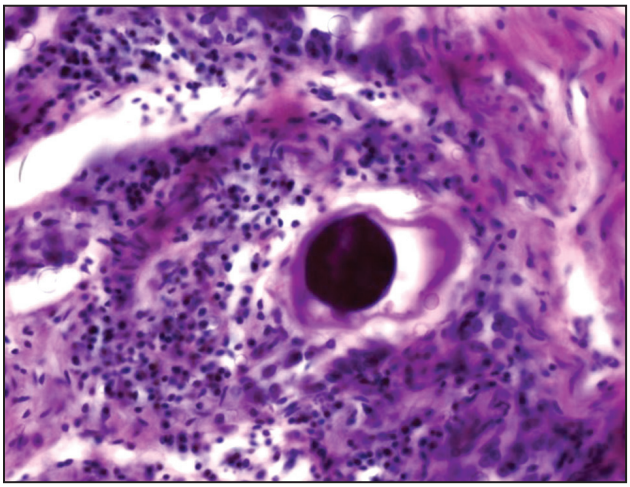

Fig 12. Developing oocyst in the mucosa of the jejunum, also moderate infiltration of the mucosa with eosinophilic granulocytes and a few macrophages (H & E X400).

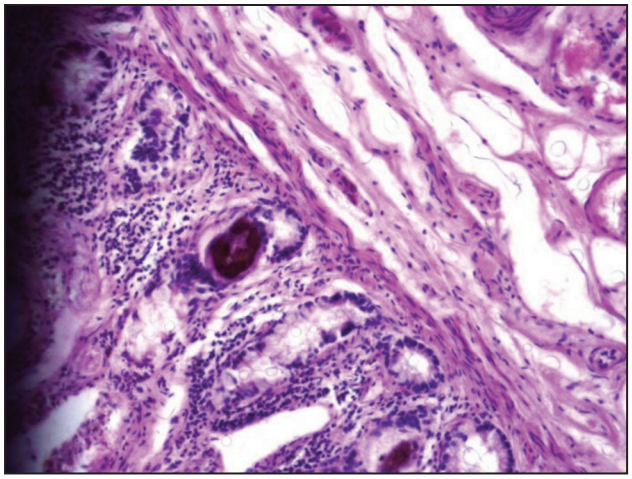

Fig 13. Section of intestine showing severe infiltration of inflammatory cells and a developing oocyst with formation of thick wall (H & E X200).

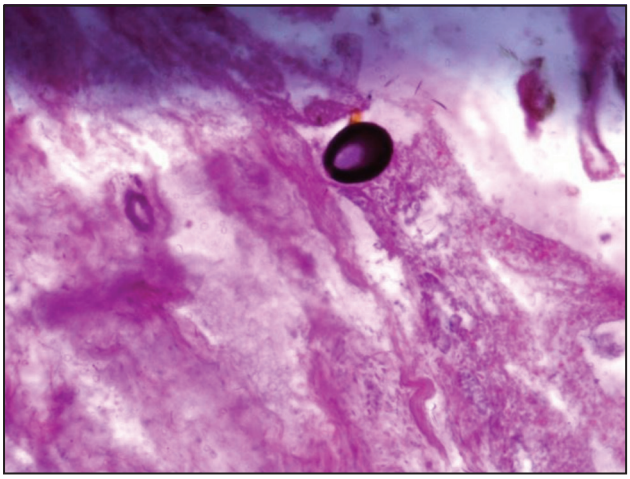

Fig 14. Section of intestine showing thick wall unsporulated oocyst of *E. Cameli* with a micropyle (H & E X200).

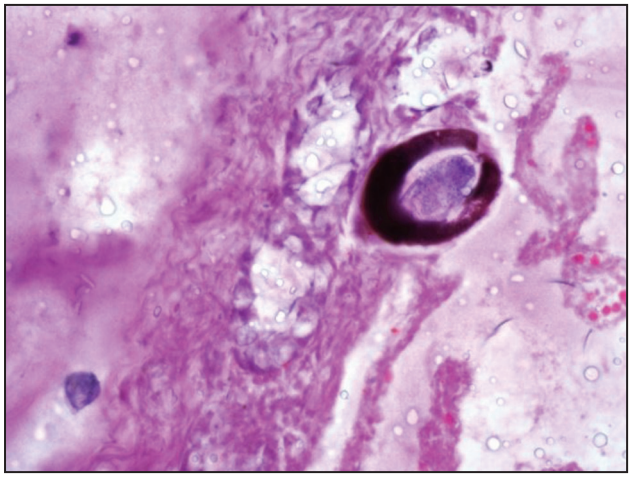

Fig 15. Oval thick-wall oocyst with a micropyle and atrophied mucosal gland with few eosinophilic granules is seen in mucosa of jejunum (H & E X400).

of the large schizonts (Fig 4). Developing oocyst occupied large wall forming body with moderate to severe inflammatory reaction was seen in mucosa of intestine (Fig 11, 12 and 13). Oocysts were oval and had refractile wall with a micropyle cap (Fig 14 and 15), and macrogamont were large with a central nucleus and peripheral plastic granules (Fig 7, 8 and 9). Moderate to severe inflammatory reaction were observed due to infiltration of eosinophils (Fig 2).

Discussion

In India, Gill (1976) found oocysts of *E. cameli, E. dromedarii, E. pellerdyi* and *E. bactriani* in 24% of faecal samples from dromedary camels. In Rajasthan prevalence of *Eimeria* spp. in camels was reported by Partani *et al* (1999). In this study occurrence of coccidiosis was recorded in 8.74%. Sazmand *et al*

Table 1. Description of Coccidial stages found in the intestinal mucosa of camels.

Stage	Size (µm)	Shape	Wall	Content
Large schizont	240 to 330	Round to ovoid	Thin	Numerous schizont
Meront	240 to 330	Round to ovoid	Thin	Numerous merozoites
Oocyst	Up to 100x80	Ovoid to Pyriform	Thick	Non sporulated

(2012) also reported occurrence of infection in samples as 9.51% in central Iran and identified species were *Eimeria cameli* (47.5%), *Eimeria dromedarii* (42.5%) and *Eimeria bactriani* (10%). Lower incidence was recorded as 1.32% by Duguma *et al* (2014) in camel at Ethiopia. Our study is conducted during winter season and higher prevalence of infection was reported by Borji *et al* (2009). Sazmand *et al* (2012) indicated that prevalence of *Eimeria* was highest during the winter, which can probably be due to confinement, crowding and limited available pasture grazing. Partani *et al* (1999) also reported higher rate of infection in rainy seasons, which may be due to higher relative humidity which is known to enhance survival of oocysts outside the host. In this study, the ileum and jejunum were the most common affected tissues with degenerated and desquamated mucosa, eosinophilic infiltration and existence of giant schizonts in the lacteals of lamina propria and in the epithelium of the Lieberkühn glands. These pathological finding were in close agreement with Cheneme (1980), Kinne and Wernery (1998), Hussein *et al* (1987), Kasim *et al* (1985), Borji *et al* (2009) and Sazmand *et al* (2012). Gamonts, unsporulated oocysts, sporulating oocysts, and fully sporulated oocysts of coccidia (*Isospora orlovi*) were recorded from camel's large intestinal epithelium and the lamina propria associated with haemorrhagic enteritis in United Arab Emirates by Kinne *et al* (2002). Histopathological investigations showed that different locations of the small intestine, especially the ileum and jejunum were similar to previously diagnosed coccidiosis by Kinney and Wernery (1998), and also similar to the first scientific description of camel coccidiosis caused by *Eimeria* (*Globidium*) *cameli* by Henry and Masson (1932). Different stages of *E. cameli* (oocysts, large schizonts, meront and macrogamont) were identified in the intestinal mucosa (Table 1). It was considered that these stages belong to *Eimeria cameli*, because immature oocysts of *E. cameli* were found within the intestinal epithelial mucosa (Levine, 1985) and sizes of different developmental stages were similar to described by Pellerdy (1965) and Kinne and Wernery (1998). The differences between *Eimeria* species and their prevalence depend on some factors such as environment, animal factors, farm management and other factors (illness and stress) but clinical manifestations appear mostly under stressful conditions and if the host is subject to heavy infection particularly after weaning reported by Yakhchali and Cheraghi (2007)

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