

# TYPES, PATTERN AND MORPHOLOGY OF ENTERITIS PREVALENT IN CAMELS OF RAJASTHAN

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## ABSTRACT

A study was conducted on 172 intestinal samples of camel for histopathological examination. All the samples were examined grossly and microscopically to study inflammatory conditions of intestine with reference to the type, pattern and morphology. Study was carried out from September 2013 to January 2014, all samples of intestinal tract were examined irrespective of age, breed and sex of camel. Out of 172 samples 103 samples representative of gross lesions were processed for subsequent histopathological examination. An overall incidence of inflammatory conditions of intestinal tract was observed as 32.04 per cent (33 out of 103). The occurrence of different type of enteritis i.e. acute catarrhal enteritis, chronic catarrhal enteritis, haemorrhagic enteritis, necro-haemorrhagic enteritis, necrotic enteritis and eosinophilic enteritis, was 15.54, 4.85, 5.83, 2.91, 1.94 and 0.97 per cent, respectively.

**Key words:** Camel, enteritis, histopathology, inflammatory

Certain lesions that affect the intestine comprises some of the most frequently encountered diseases in clinical practice for instance infarcts, haemorrhage etc. Intestinal coccidiosis (Kinne *et al*, 2002), inflammatory disorders, tuberculosis (Kasaye *et al*, 2013), para-tuberculosis (Alharbi *et al*, 2012), non-specific enteritis, multicentric fibromyxoid peripheral nerve sheath tumour (Khodakaram-Tafti and Khordadmehr, 2011) etc. were reported previously. The pathological condition of intestine in camel has not so far been studied extensively. Thus study was undertaken to find out gross and histopathology of inflammatory conditions of camel intestine with reference to the type, pattern and morphology, so that the diseases of gastro-intestinal system can be diagnosed properly.

## Materials and Methods

For the present study 172 tissue samples of the intestinal tract were collected from carcasses of camels of either sex, irrespective of age groups and breeds during postmortem examination from September, 2013 to January, 2014. Out of these, 103 samples showing gross lesions were used for gross and histological studies. All the samples were collected in 10 per cent normal saline for histopathological examination. The tissues were processed mechanically for paraffin embedding by acetone and benzene technique (Lillie, 1965). The tissue sections of 4-6 micron thickness were cut and stained with H and

E stain. The detailed histopathological observations were recorded.

## Results and Discussion

Different type of enteritis recorded in present study is placed in table 1. An overall incidence of inflammatory conditions of intestinal tract observed was 32.04 per cent (33 out of 103) which corresponded well with the findings of Rathore (1998) who recorded 33.62 per cent death due to digestive disorders i.e. enteritis and hepatitis in buffaloes.

**Table 1.** Different types of enteritis recorded in present study.

S. No.	Type of condition	No. of sample	Percentage
1.	Acute catarrhal enteritis	16	15.54
2.	Chronic catarrhal enteritis	5	4.85
3.	Haemorrhagic enteritis	6	5.83
4.	Necro-haemorrhagic enteritis	3	2.91
5.	Necrotic enteritis	2	1.94
6.	Eosinophilic enteritis	1	0.97
	<b>Total</b>	<b>33</b>	<b>32.04</b>

## Acute catarrhal enteritis

Grossly, the surface of intestine was oedematous, thickened and there was an increased amount of mucous exudate in the lumen with moderate hyperaemia in some cases. The mucosa was red and villi were congested. These findings were in agreement

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with reports of Libby *et al* (1997). There was heavy infiltration of neutrophils, lymphocytes and plasma cells in mucosa and submucosa (Fig 2). Degeneration and sloughing of the surface epithelium was seen which was most prominent on the tips of the villi (Fig 1). These conditions were in accordance with the earlier reports of Libby *et al* (1997). This condition was recorded in 15.54 per cent cases but lower incidences (9.6 per cent) were also recorded by Liebler *et al* (2006) in cattle infected with BVDV1 and BVDV2 (Bovine viral diarrhoea virus).

In the present study, the possible causes responsible for acute catarrhal enteritis could be bacteria like *Salmonella* (Sanousi and Gameel, 1993; Libby *et al*, 1997; Wood *et al*, 2000 and Wernery and Kaaden, 2002) and *E. coli* frequently associated with others like *Salmonella*, *Clostridia*, *Corona* and *Rota* virus (Wernery and Kaaden, 2002) etc. Other reported causes are viral diseases like Bovine Viral Diarrhoea (Liebler *et al*, 2006), *Rota* and *Corona* virus infection (Freitag *et al*, 1984) and *Corona* virus infection (Wünschmann *et al*, 2002). Besides these copper and molybdenum deficiencies (Sastry and Rao, 2005) or copper sulphate administration (Abu-Damir *et al*, 1993) or coccidial infection (Mahmoud *et al*, 1998) may contribute to the disease.

### **Chronic catarrhal enteritis**

Grossly it was observed that the intestine was hard and thickened, oedematous, and the mucosa was hyperaemic. These findings were similar to the findings of Cohrs (1967). Microscopically, there was sloughing of the mucous membrane and most of the villi were shortened with degenerated surface epithelium, heavy cellular infiltration was also noted in the entire wall of the affected intestine. The predominant cells were macrophages, lymphocytes and plasma cells (Fig 3). Chronic catarrhal enteritis in the present study had low incidence and could be due to any chronic metabolic or hepatic disorder or chronic bacterial infection i.e. paratuberculosis, (Wernery and Kaaden, 2002 and Alharbi *et al*, 2012). This condition was recorded in 4.85 per cent cases; higher incidences were recorded by Taylor *et al* (1997) as 25 per cent in cattle calves infected with bovine viral diarrhoea.

### **Haemorrhagic enteritis**

Grossly, the haemorrhages varied in different cases from punctiform to ecchymotic types. Rivero *et al* (2001) also reported same conditions in cattle and sheep due to poisoning of *Anagallis arvensis*. The haemorrhagic lesions were visible even through the mucosal surface of the intestine. These were deep-red

to deep brown in colour and in almost all cases, they were patchy but not generalised. Microscopically, the wall of the intestine showed focal haemorrhages possibly due to intestinal coccidiosis (Kinne *et al*, 2002 and Kumar *et al*, 2013). Erosion of the epithelium with accompanying cellular infiltration comprising of red blood cells and mononuclear cells (Fig 4 and 5) were also seen and most of the villi were found to be congested and extremely denuded. This condition was recorded in 5.83 per cent cases which corresponded well with findings recorded by Zajicek *et al* (1986) who reported that 5.46 per cent in calves infected with *Cryptosporidia*.

Haemorrhagic enteritis might be because of grazing of toxicological plants (Rivero *et al*, 2001), bacteria such as *Campylobacter jejuni* (Shahawy *et al*, 2009), *Salmonella* (Nour-Mohammadzadeh *et al*, 2010) and *Clostridium perfringens* (Moebuu *et al*, 1966; Ipatenko, 1974; Szemredi *et al*, 1976; Chauhan *et al*, 1985; Gameel *et al*, 1986 and Fowler, 1989) and heavy parasitic infection such as coccidiosis (Kinne and Wernery, 1997). Some agrochemical substances such as methyl parathion can also cause haemorrhagic enteritis (Zhelev *et al*, 1986).

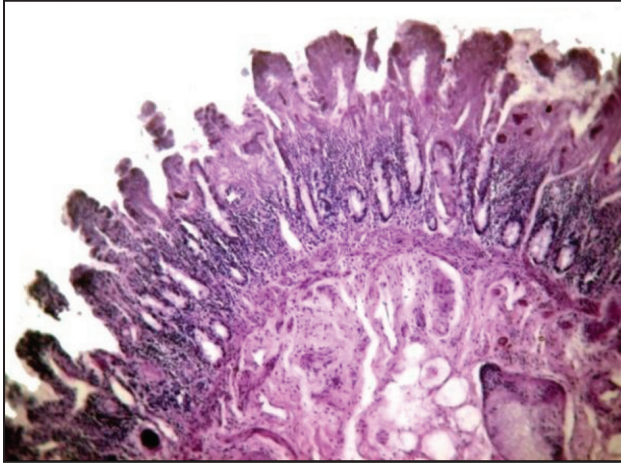
### **Necro-haemorrhagic enteritis**

The gross and microscopic findings were haemorrhagic, degenerative and necrotic changes along with the infiltration of polymorphonuclear and mononuclear cells we are in close approximation to the findings recorded by Oryan *et al* (1996) and Manteca *et al* (2002). This condition was recorded in 2.91 per cent cases.

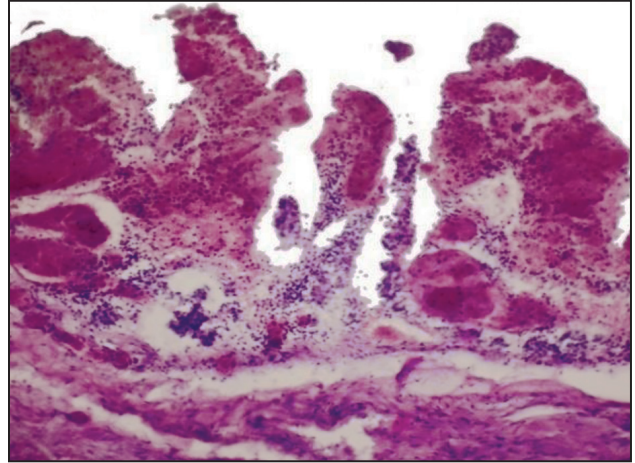
The necro-haemorrhagic enteritis might be due to bacteria such as *Clostridium perfringens* (Moebuu *et al*, 1966; Ipatenko, 1974; Szemredi *et al*, 1976; Chauhan *et al*, 1985; Gameel *et al*, 1986 and Manteca *et al*, 2002) or some virus like Bovine adenovirus (Thompson *et al*, 1981) or coccidial infection (Kinne and Wernery, 1998; Chhabra and Sangwan, 2006). Beside these many poisonous plants can also be an important cause of necro-haemorrhagic enteritis (Oryan *et al*, 1996).

### **Necrotic enteritis**

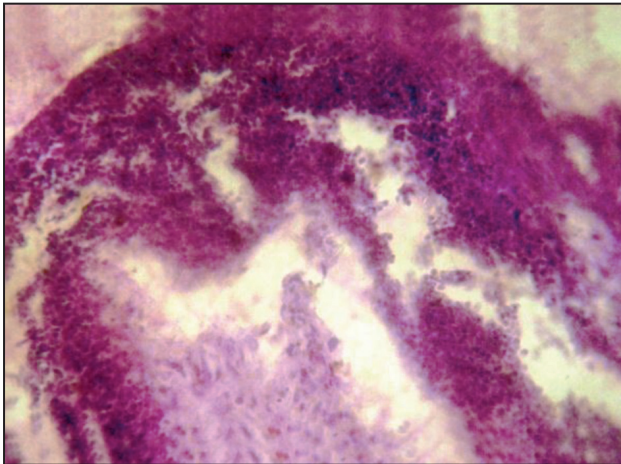
The gross findings of necrotic enteritis were patchy necrotic areas on the intestinal mucosa. These findings were in close approximation to the observations reported by Penny *et al* (1991). The microscopic findings showing coagulative necrosis of denuded intestinal glands and neutrophilic infiltration were in close conformity with the earlier reports of Penny *et al* (1991) and Smiley *et al*



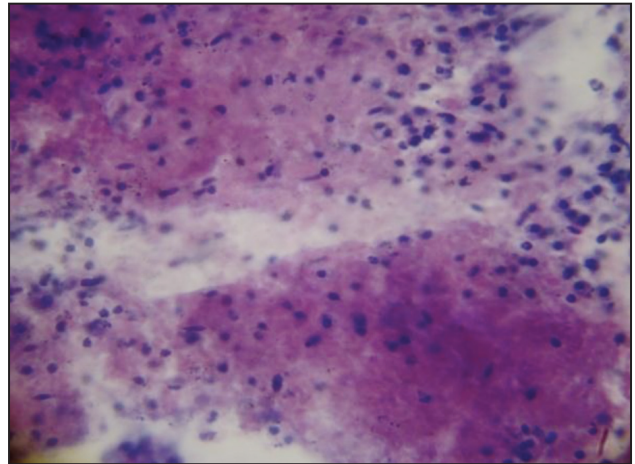
**Fig 1.** Section of intestine showing shorter and blunter villi, sloughing of mucous membrane of villi, infiltration of inflammatory cells in mucosa and submucosa of intestine (H & E, 100X).



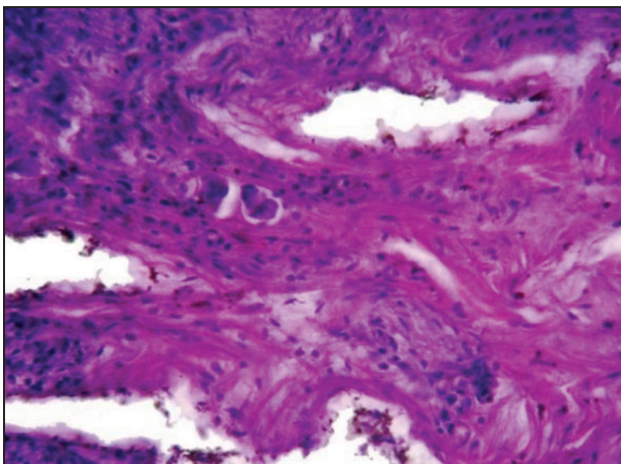
**Fig 4.** Section of small intestine showing extensive haemorrhagic and congested mucosa of villi along with infiltration of RBCs and mononuclear cells (H & E, 100X).



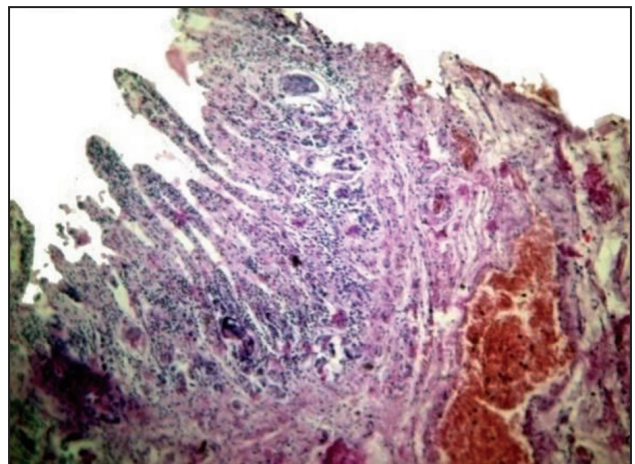
**Fig 2.** Section of intestine showing severe cellular infiltration mainly of neutrophils and few lymphocytes (H & E, 400X).



**Fig 5.** Higher magnification of Fig 4 : infiltration of erythrocytes and polymorphs and mononuclear cells in mucosa of villi (H & E, 400X).



**Fig 3.** Section of intestine showing necrotic villi along with infiltration of inflammatory cells in mucosa mainly of lymphocytes, plasma cells and macrophages (H & E, 400X).



**Fig 6.** Section of intestine showing infiltration of polymorphs and eosinophils in mucosa of villi, congested blood vessel in submucosa of intestine (H & E, 100X).

(2002). This condition was recorded in 1.94 per cent cases.

This condition might be caused by many etiological factors such as bacteria like *Clostridium perfringens* (Vegad and Katiyar, 2004), *Salmonella* (Wray and Sojka, 1978), viruses like Corona virus (Langpap *et al*, 1979) and bovine viral diarrhoea (Penny *et al*, 1991), parasite like coccidia (Chhabra and Sangwan, 2006) and vitamin deficiency like niacin deficiency (Sastry and Rao, 2005).

### **Eosinophilic enteritis**

The gross findings of eosinophilic enteritis were in agreement to the Cebra *et al* (1998), Swain *et al* (2003) and Zheng *et al* (2008) who also found oedematous intestinal wall. The microscopic findings showing granulomatous inflammation and infiltration by eosinophils (Fig 6) were in close conformity with the observations of Sweeney *et al* (1986), Van der Gaag and Van der Linde- Sipman (1987), Rodriguez *et al* (1995) and Kheirandish *et al* (2012). This condition was recorded in 0.97 per cent cases.

Eosinophilic enteritis in the present study might be of idiopathic origin. It is commonly found in dog but rare in cattle and camels. Besides these, the disease might be associated with specific etiology e.g. *Histoplasma*, *Mycoplasma* (Jubb *et al*, 2007), parasitic infection (Gahlot and Chhabra, 2009) and coccidiosis (Kinne and Wernery, 1997; Chhabra and Sangwan, 2006).

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