

## Clinical and pathological investigation of goat disease in nuclear breeding farm

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### ABSTRACT

The mortality of goats is one of the major problems confronting goat husbandry in this country. The present study was undertaken with the aim to investigate the mortality of goats of various etiologies at nuclear breeding flock. A total of 114 goats of both sexes and of different ages were examined during this study period. Suspected cases of mortality were confirmed by clinical findings before death, postmortem findings and histopathological examination. Mortality rate was higher in group-3 age group (37.5%), than group-1 (34.37%) and group-3 (28.12%). Season wise incidence of mortality was highest in season-3 (46.87%) followed by season-2 (31.25%) and season-1 (21.87%). The causes of mortality were bloat (15.62%), diarrhoea (18.75%), pneumonia (21.87%) enterotoxaemia (12.5%), Fascioliasis (12.5%), Hydatid diseases (6.25%), colibacillosis (6.25%) and urinary problem (6.25%). Indeed the incidence of the diseases mortality in goat of this farm could be reduced to a substantial rate by improving the management system currently practicing in the farm.

### Introduction

Among the Asian countries, Bangladesh has the second highest population of the Black Bengal goat which accounted for about 7.40% of the total population in Asia (FAO, 1997) and is the third highest repository of goat possessing (4.90%) of the world (Amin *et al.*, 2000). The mortality of goats is one of the major problems confronting goat husbandry in this country. Diseases of goats of various etiologies have been reported from Bangladesh (Rahman *et al.* 1975; Rahman & Ahmed, 1976; Nooruddin *et al.* 1987; Nooruddin & Barik, 1989; Amin *et al.* 2000; Ershaduzzaman *et al.* 2007). However, those scattered reports are scanty and studied from the rural house hold livelihood small farmers.

Scientific breeding, feeding, management and disease control are the key points of success in livestock development. Keeping in view the important role of goats in rural farming of Bangladesh, a biosecurely nuclear breeder of Black Bengal Goat Farm has been established at the BAU campus through United States Department of Agriculture (USDA) funded project entitled "Conservation of Black Bengal Goat as the Potential Genetic Resource in Bangladesh." The objectives of the project are to select the best quality buck for collection and preservation of semen and use of preserved semen for artificial insemination to improve the productivity of Black Bengal Goat in Bangladesh. Preventive health care of this farm included, Bio-security, health management (medication and treatment, vaccination and parasite control program) dipping, supplement of good nutrition and feeding management and predator management. Bio-security procedure that

maintained in the farm are started with healthy stock, bought from local market, isolated the new animals for at least 30 days, maintain a closed herd, prevention of loan equipments, limit access to farm and animals, control of dog, cat, rodent, fly, and bird populations, cleaning and disinfection of all equipments, feeder, waterer and sheds, isolation of the infected animals, prompt disposal of dead goats, etc.

The present study was aimed to investigate the incidence of different diseases of goat in that bio-secured farm, to explore the cause of mortality of goat in different age, sex and seasons, through examining the clinical pathology of diseases and to study the morphological lesions (gross and microscopic) of the organs arising from different diseases.

### Materials and Methods

A total number of 114 goat population of different age groups and sexes were examined during the period of October, 2007 to October, 2008 in this nuclear breeding flock of Black Bengal Goat.

#### Clinical pathology

To aid in diagnosis of different diseases blood examination, feces examination and skin scraping was done. All protocol obtained from Coles E. H. (1986).

#### Pathological Study

Dead animals were examined through necropsy (gross) and histopathological study. During the postmortem examination the suspected samples

were collected and fixed in 10% neutral buffered formalin. After fixation the tissues were processed, sectioned and stained as per standard procedure (Luna, 1968). Photomicrography was taken at the Department of Pathology using photomicrographic camera (Olympus PM-C 35 Model).

## Results and Discussion

### Causes of mortality of goats in different seasons

**Table 1.** Incidence of mortality in different season.

Diseases	Season-1 (March-June)		Season 2 ( July-October)		Season-3 (November-February)		Overall mortality in different sex groups			
	Total	Mortality (%)	Total	Mortality (%)	Total	Mortality (%)	M	Mortality (%)	F	Mortality (%)
Bloat	1	14.3	3	23.1	1	8.3	2	16.7	3	15.0
Diarrhoea	1	14.3	2	15.4	3	25.0	1	8.3	5	25.0
Pneumonia	0	0	0	0	7	58.3	3	25.0	4	20.0
Enterotoxaemia	0	0	3	15.4	1	8.3	1	8.3	3	15.0
Fascioliasis	1	14.3	3	23.1	0	0.00	2	16.7	2	10.0
Urinary problem	1	14.3	1	7.8	0	0	2	16.7	0	0.0
Colibacillosis	2	28.8	0	0	0	0	1	8.3	1	5.0
Hydatid cyst	1	14.3	1	7.8	0	0.00	0	0.0	2	10.0
Total	7	22.0	13	40.7	12	37.5	12	37.5	20	62.5

Incidence of mortality was highest in season-2 (40.7%), rainy season followed by in season-3 (37.5%), winter season and season-1 (22.0%), dry period (Table 1). Major causes of death in all age group of goats were due to pneumonia (58.3%) in winter season. Mortality due to parasitic infestation was highest in rainy season (season-2). Incidence of mortality was highest in female (62.5%) than male (37.5%). This higher mortality in intensive rearing systems possibly due to increase stresses on animals.

**Table 2.** Incidence of mortality of goat in different age group.

Diseases	Group-1 (<6 months)		Group-2 ( 7-12 months)		Group-3 (>1 year)		Overall (%) mortality	
	Total	Mortality (%)	Total	Mortality (%)	Total	Mortality (%)	Total	Mortality (%)
Bloat	0	0	3	33.3	2	18.2	5	15.6
Diarrhoea	3	25	1	11.1	2	18.2	6	18.8
Pneumonia	5	41.7	1	11.1	1	9.1	7	22
Enterotoxaemia	1	8.3	1	11.1	2	18.2	4	12.5
Fascioliasis	0	0	1	11.1	3	27.3	4	12.5
Hydatid diseases	0	0	1	11.1	1	9.1	2	6.3
Urinary problem	1	8.3	1	11.1	0	0	2	6.3
Colibacillosis	2	16.7	0	0	0	0	2	6.3
Total	12	37.5	9	28.1	11	34.4	32	

### Age wise mortality in goats

It appeared that incidence of mortality was higher (37.5%) in Group-1 age than Group-3 (34.4%) and Group-2 (28.1%) (Table 2). The major causes of mortality in Group-1 were pneumonia (41.7%) and diarrhoea (25.0%). Major causes of mortality in Group-2 were due to bloat (33.3%). Animals (aged > 1 year) had highest mortality rate (27.3%) due to Fascioliasis. Death due to parasitic infestation and bloat was not found in Group-1 age groups during in this study but few kids were died due to low birth weight.

This study revealed highest mortality in the group-1 (0-6 month) (37.5%), than group-3 (>1 year) (34.37%) and group-2 (28.12%) and mortality was highest in female than male. Similar trends of the mortality were also demonstrated by Ershaduzzaman et al. (2007) and Soundararajan et

al. (2006). Incidence of mortality was highest in season-2 (40.87%) winter, followed by season-3 (31.25%) rainy and season-1 (21.87%) summer which is in accordance with the study of Palanivel and Gajendran (2006). Higher mortality was observed in intensive rearing systems possibly due to increased stresses on animal, to which they responded by higher diseases incidence and mortality (Chowdhury et al. 2002).

### Pathological studies of different diseases

#### Bloat

This studies found ruminal acidosis or bloat as one of the most important digestive disorders in goats. In this fatal disorder the essential feature is that the rumen stops working; there are no more contractions of sufficient force to move the contents forward along the normal digestive

course nor to regurgitate them for "chewing the cud. The intoxication of large amounts of highly fermentable carbohydrate diet feed causes this disease due to excessive production of lactic acid in the rumen (Blood et al. 1983). The mortality rate of this condition is reported to be high in goats (Sen et al. 1984). The present study recorded death of 5 (15.62%) animals due to this condition. The clinical history of these cases similar to the earlier reports (Misra & Singh 1974; Blood et al. 1983; Sen et al. 1988). On the other hand, postmortem changes, as observed are in full conformity with the descriptions of Jones and Hunt (1997) and Blood et al. (1983). This fatal disorder could be stopped by preventing the goats from free from excessive ingestion of highly fermentable carbohydrate diet feed.

### Diarrhoea

Diarrhoea was identified as another important fatal disorder in (14.06%) goats. Mixed infections due to microbial and parasitic causes are now more common than single infections in causing diarrhoeic syndrome (Blood et al. 1983; Braun et al. 2000; Soundararajan et al. 2006; Haque et al. 2007) however, these cases was diagnosed on the basis of clinical, epidemiological, microbiological and pathological findings and on the response to treatment. Diarrhoeic syndrome was found due to suspected microbial causes were enterotoxaemia and colibacillosis about 1.56% and 2.34%. Haque et al. (2007) conducted to isolate and determine the etiologic agents causing diarrhoea in goats and found *Salmonella* sp. (5.0%), *Staphylococcus* sp. (10.0%), *Escherichia coli* (25.0%), *Bacillus* sp. (85.0%) and *Clostridium* sp. (65.0%) were identified in single or mixed infection. Enterotoxaemia which is caused by *Clostridium perfringens* type-1 (suspected) was observed in 6 goats and total incidence was 2.34% in all age groups.

Characteristic signs revealed good body condition with severe diarrhoea. At necropsy, the small intestine was diffusely necrotized with presence of diffuse hemorrhage in intestine, congested liver, compacted undigested food materials in rumen, the heart and lungs were also congested which substantiates the earlier findings (Jones & Hunt 1997; Blood et al. 1983; S. Miyashiro et al. 2007) in Figure 7. On histopathological study, the liver presented degeneration and necrosis of the centrilobular area, moderate (occasionally severe) inflammation and hemorrhage of the small intestinal mucosa and severe pulmonary congestion (Figure 5). Although the classical pulpy kidney another common name for type D enterotoxaemia, has been reported to be absent in calves and goats is similar to this study, but Jones and Hunt (1997) and S.

Miyashiro et al. (2007) reported this characteristic in their study.

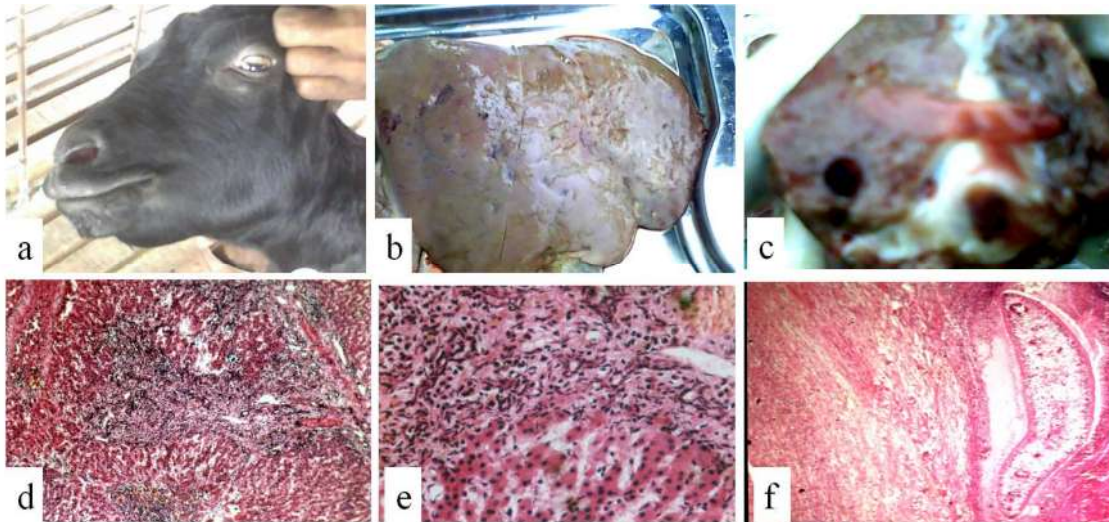
### Parasitic infestation

Highest incidence of parasitic infestation was recorded in mixed parasitic infestation (6.9%) then Fascioliasis (6.0%) and Paramphistomiasis (3.9%). Death due to Fascioliasis (12.5%) and Hydatid disease (6.25%).

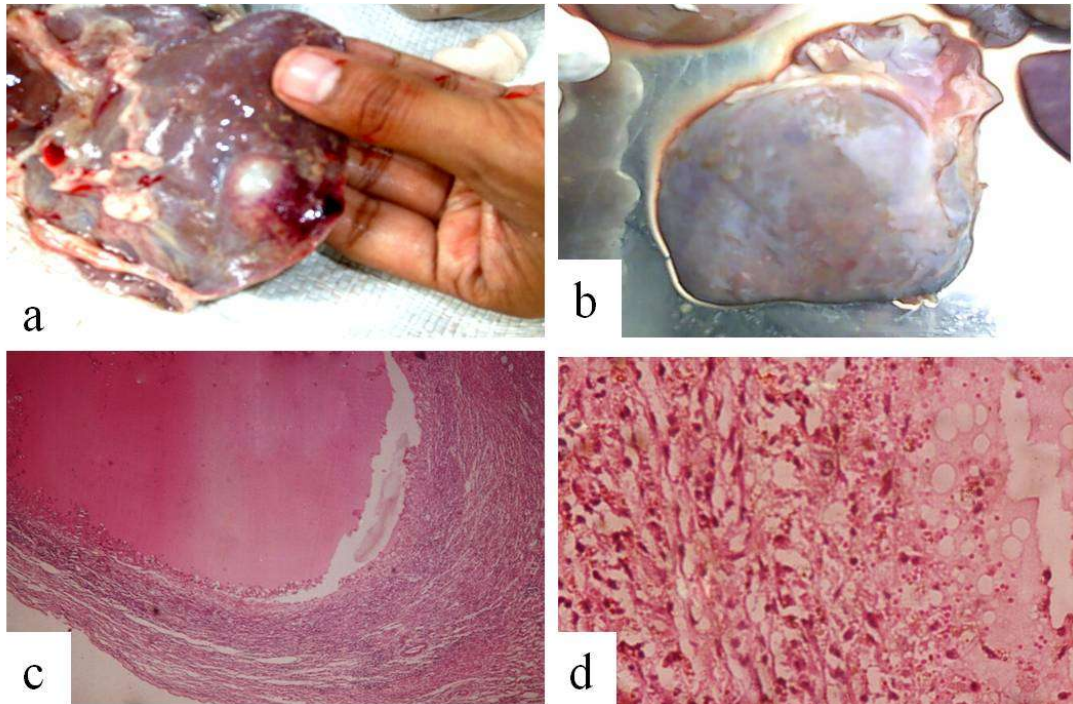
### Fascioliasis

Total incidence of Fascioliasis was highest 6.89% in rainy season (Season-2, 8.07%) due to lack of proper pasture management and group-3 was more affected than others. The animals which died due to chronic Fascioliasis showed persistent diarrhoea, progressive emaciation, submandibular edema (Figure 1a). The early stage of postmortem changes by *F. gigantica* infection was characterized by badly damaged liver. The affected livers lost normal color and appeared to be much more friable (Figure 2b). Degenerated and necrosed hepatocytes and infiltration of large numbers of polymorphs and mononuclear cells in the liver parenchyma of goat suffered from Fascioliasis (Figure 2c). Proliferation of periductal connective tissue in Fascioliasis which in turn was infiltrated by large numbers of polymorphs, plasma cells and mononuclear cells (Figure 2d).

The gross and microscopic lesions of early stage and chronic fascioliasis are in conformity with the earlier findings (Soulsby, 1982; Stephen & Hutchinson, 2003). The development of hemorrhagic tracts on hepatic parenchyma could be the indication of transperitoneal route of migration of the young flukes. The damage of hepatic cells near these tracks or tunnels might have resulted from the feeding habit of these pre-adult parasites (Ona & Isoda; 1952; Dawes & Hughes, 1964; Arora & Lyer, 1973). Some juveniles become encysted in the parenchyma. Healing proceeds and the tracts are replaced by scar tissue. Connective tissue proliferates resulting in fibrosis (Figure 1). Acute and sub-acute forms of fascioliasis develop 2-3 weeks after massive infections and signs include anorexia, abdominal pain, yellowish and pale conjunctivae, weight loss and sudden death. Clinical signs develop more slowly in the chronic form and include ill thrift, anemia, and submandibular edema ('bottle jaw') in Figure 1. Production losses can be economically significant even in relatively light fluke infections (Dawes, 1961ab; Reid, 1973).



**Figure 1a.** Bottle jaw in a typical case of Fascioliasis in goat. (b): Diffusely inflamed and congested liver in Fascioliasis in goat, (c): Adult leaf like flukes is seen in the highly distended bile ducts. (d): Degenerated and necrosed hepatocytes and infiltration of large numbers of polymorphs and mononuclear cells in the liver parenchyma of goat suffered from Fascioliasis. (e): Proliferation of periductal connective tissue in Fascioliasis which in turn was infiltrated by large numbers of polymorphs, plasma cells and mononuclear cells. (f) Cross section of parasites in cystic capsule.



**Figure 2.** (a) Cyst like structure was found in affected liver of Hydatid diseases. (b) Swollen portion in spleen. (c) Viable cysts enclosed within laminated fibrous capsule and embedded in substance of affected liver. (d) Proliferation of connective tissue in cystic wall.

**Hydatid diseases**

Among fifteen (5.85%) mixed parasitic infestation (*Paramphistomam sp.*, *Trichuris sp.* and Hydatid diseases) two goats were died by Hydatid diseases and mortality rate was 6.25%. On postmortem examination, cyst like structure was found in liver (Figure 1a). Viable cysts enclosed within laminated fibrous capsule and embedded in substance of

affected liver with presence of cross section of parasites in cystic capsule (Figure 2b and c).

Among the parasitic infestation, the highest mortality rate of goats was due to fascioliasis (12.5%). No death was recorded due to specific *Paramphistomum* infection and anemia and emaciation of the host was observed but death was found with mixed fluke infection with *F. gigantica*



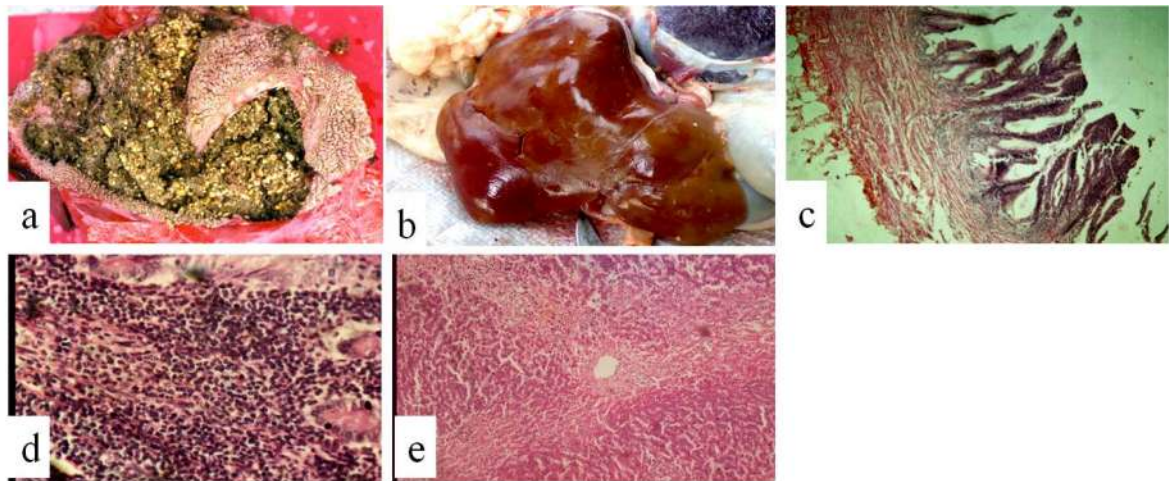
and *Amphistomes* spp. Clinical reports on pathogenesis and pathology of such mixed fluke infection in goats are scanty. However, Hossain et al. (1988) reported mortality of young goat due to such infection from this country. The remarkable pathological changes of liver as found in this type of mixed infection could be the result of enhanced effect of two groups of fluke. The incidence of mixed parasitic infestation with gastrointestinal nematodiasis and Hydatid diseases was about 3.9%. Death due to hydatid disease was about 6.9% for mostly liver infection whereas Haridy et al. (2006) investigated Hydatidosis 0.68% in goats and there was a significant difference between animals regarding liver infection, but was highly significant for lung infection. Viable cysts enclosed within laminated fibrous capsule and embedded in substance of affected organ (Stephen & Hutchinson, 2003).

**Pathological study of Microbial causes of diseases:**

Diarrhoea was identified as another important fatal disorder in (14.06%) goats. Diarrhoeic syndrome was found due to suspected microbial causes were enterotoxaemia and colibacillosis about 1.56% and 2.34%.

**Enterotoxaemia**

Total four goats were died due to suspected enterotoxaemia which is associated with enteritis and diarrhoea. On postmortem findings, diffuse hemorrhage in intestine, congested liver, compacted undigested food materials in rumen, congested heart and lungs were observed (Figure 3ab). On microscopic examination, in liver, necrosis of the centrilobular area and varying degrees of hyperemia, hemorrhage and cellular infiltration in the mucosa and submucosa in intestine showing in Figure 3 (a ,b, c).



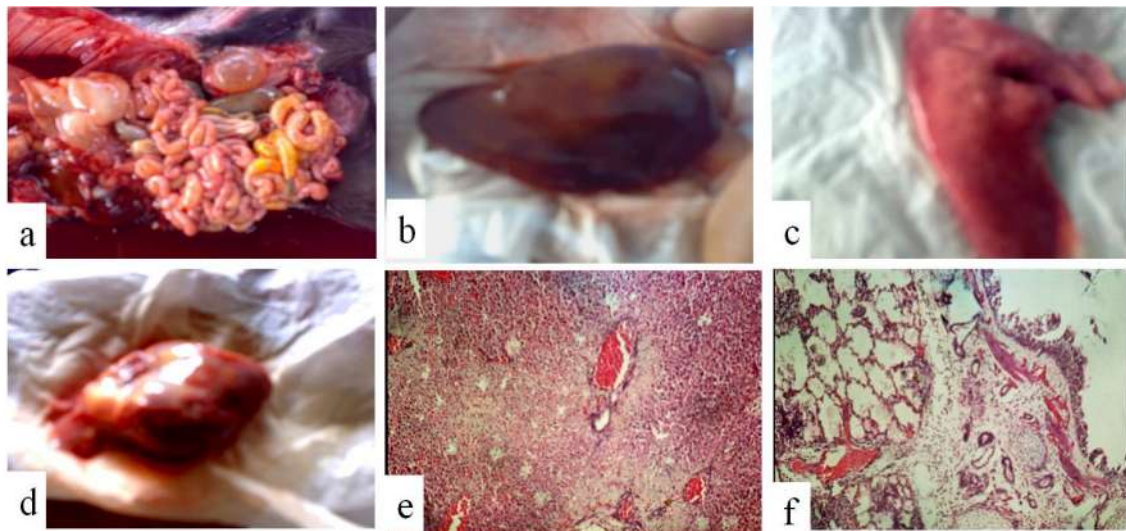
**Figure 3.** Postmortem lesion of enterotoxaemic goat. (a) Compact and undigested food particles in rumen. (b) Congested liver with loss of its normal shape and size. (c) Varying degrees of hyperemia, hemorrhage and cellular infiltration in the mucosa and submucosa. (d) Infiltration of by huge numbers of polymorphs, plasma cells and mononuclear cells in small Intestine. (e) Degenerated and necrosed hepatocytes of the liver parenchyma of enterotoxaemic goat.

At necropsy, the small intestine was diffusely necrotized with presence of diffuse hemorrhage in intestine, congested liver, compacted undigested food materials in rumen, the heart and lungs were also congested which substantiates the earlier findings (Jones & Hunt 1997; Blood et al. 1983; S. Miyashiro et al. 2007). On histopathological study, the liver presented degeneration and necrosis of the centrilobular area, moderate (occasionally severe) inflammation and hemorrhage of the small intestinal mucosa and severe pulmonary congestion (Figure 2). Although the classical pulpy kidney another common name for type D enterotoxaemia, has been reported to be absent in calves and goats is similar to this study, but Jones and Hunt (1997) and

Miyashiro et al. (2007) reported this characteristic in their study.

**Colibacillosis**

Clinical signs of the affected kids were fever, depression, diarrhoea. At necropsy examination showed petechial hemorrhages in the epicardium, haemorrhagic enteritis; congested liver and lung (Figure 4a-d). Histopathological examination showed that the intestinal mucosa were in varying degrees of erosion or ulceration, congestion in central vein and necrotic foci in liver, pulmonary congestion and hemorrhage on pericardium (Figure 4ef).

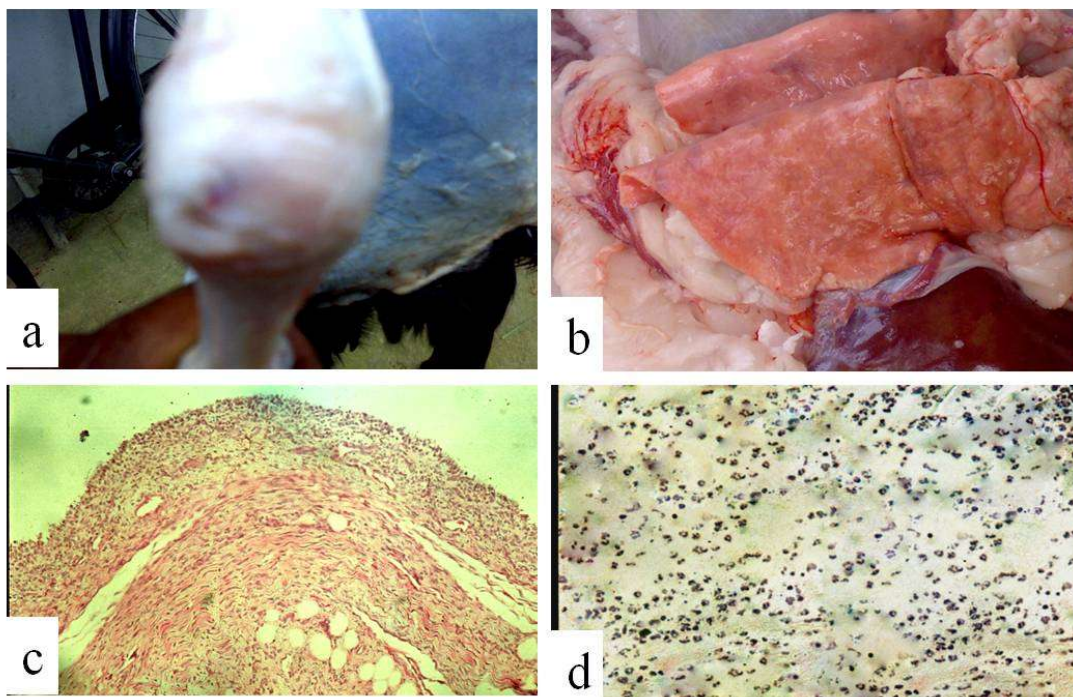


**Figure 4.** Hemorrhage and congested intestine of kid of suspected colibacillosis. (b) Congested liver of suspected colibacillosis. (c) Congested lung of suspected colibacillosis. (d) Congested heart of suspected colibacillosis. (e) Intense hyperemia, degeneration and necrosis of the centrilobular area of liver. (f) Pulmonary congestion in lung.

The present investigation also revealed that total three kids were died by colibacillosis and incidence of mortality was about 6.25%. However, no isolation was performed in this study. Only clinical signs were used to diagnose the disease. Clinical signs of the affected kids were fever, depression, diarrhoea. At necropsy examination showed petechial hemorrhages in the epicardium, haemorrhagic enteritis; congested liver and lung (Figure 4) also observed by Abou et al. (2000).

#### **Caprine Arthritis Encephalitis (CAE)**

On postmortem examination, congested lungs and swollen carpal joints with edematous fluids are found (Figure 5ab). Joint fluids contain excessive numbers of mononuclear cells with extensive proliferation of the synovial membrane (Figure 5cd).



**Figure 5.** (a) Swollen of carpal joint of goat affected by CAE. (b) Congested lung of goat affected by CAE. (c) Edematous fluid with extensive proliferation (projection) in Synovial membrane. (d) Lymphocytic infiltration in meninges.



Caprine arthritis-encephalitis (CAE) is one of the major infectious diseases occurring in goat breeding farm (Konishi et al. 2004; Silva et al. 2005) where the present investigation identified a suspected case, again which was not confirmed in the present study. Clinical sign revealed pronounced lameness where animals are unable to extend the limbs and may walk on their knees whereas Konishi et al (2004) found arthritis of the carpal joints and occasionally by pneumonia was observed among goats. On postmortem examination, congested lungs and swollen carpal joints with edematous fluids are found (Ngatia et al. 2005).

**Contagious ecthyma**



**Figure 6.** Contagious Ecthyma: Typical lesions of thick and wart-like proliferative lesions on the outer commissure of lips and nostrils.

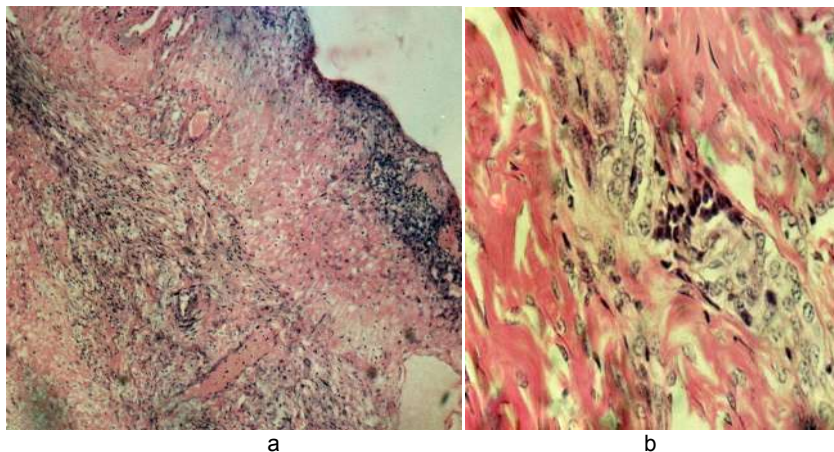
Eighteen goats (7.03%) were affected by contagious ecthyma of which disease incidence rate

in Group-3 (1-6 months) age was highest 12.16% among the other groups. The affected animals were recovered within two weeks but no death. Total nine goats were affected during Season-2 and incidence rate was 7.75%, followed by 10% and 5.26% in Season-1 and Season-3. On clinical examination, the lesions were found to be proliferative on the lips, nostrils and gingiva but were not pruritic (Figure 6).

The present investigation found that among viral diseases incidence of contagious ecthyma was 7.03% and mostly found in young age. No death was recorded due to Contagious ecthyma and clinical presentation was similar to previous study (Ashok-Kumar et al. 2004; Abeledo et al. 2002) characterized by the formation of papules in lips and sometimes in eyes and ears, and outer commissure (Figure 6).

**Urinary disorder**

Total eight goats were suffered from urinary problem (Anuria-5 and Urolithiasis-3) in which two animals were died and mortality rate was (6.25%), characterized by retention of urine. Anuria due to injury or infection in penis was also found. Incidence of urinary problem was higher in Group 3 (2.7%) age groups than others. In sigmoid plexus some calculi materials were detected with highly distended and in one cases ruptured urinary bladder was seen. Histopathologic study of sigmoid plexus shows mononuclear cells infiltrations in the smooth muscles layer in the sigmoid plexus (penis) and congested capillaries in the urinary bladder of anuric goat.



**Figure 6.** (a) Congested capillaries in the urinary bladder of anuric goat. (b) Mononuclear cells infiltrations in the smooth muscles layer in the sigmoid plexus (penis) of anuric goat (40 X).

Anuria, either complete or partial could be developed due renal insufficiency and failure. There are varieties of causes for such disorder. Injury in penis and urethral obstruction by calculi is one of the most common causes of Anuria. There are many reports of such complications in farm as well as pet animals (Mia, 1967; Sato & Omori 1979; Matthews, 2006; Vathsala, 2006). However, all the goats were kept on enriched diet and special

care for fattening. But this studies failed to detect the presences of calculus in rest seven cases. This relationship between nutritional factors and urolithiasis has been a subject for investigation for many year. it has been found that food that are either high in phosphate and magnesium low in calcium and chloride are be potentially calculus provoking (Lawis et al. 1978). Therefore, in order to prevent Urolithiasis in fattening goats

they should be allowed for free grazing because the incidence of such disorder is reported to be low in goats which are allowed to receive adequate amount of carotene (Schmidt, 1941) on the other hand the concentrate feeding should be supplemented with sodium chloride because salt has inhibitory effect in prevention of calculus formation (Udall et al. 1965).

### Pneumonia

The pneumonia is considered as one of the most important causes of mortality of goats in various parts of the world (Vihan et al. 1986; Ershaduzzaman et al. 2007; Singh et al. 2008) where total incidence was 11.71% and mortality was 21.87%. Highest mortality was in 0-6 months of age followed by 6-12 months (Qadir, 1983; Oyeyemi & Akusu, 2005). This study observed highest mortality in season-3 (46.67%) that is not similar with previous studied by Ashok-Kumar et al (2004) where maximum mortality was observed in summer (36.10%). Clinical signs showed high rise of body temperature, serous, mucoid or mucopurulent nasal discharge, cough, moist and crackles rales on auscultation of the lung (Islam et al. 2006) Microbial analysis was not included in this study, therefore it is difficult to give focus on etiological agents. However, depending on clinical history and pathological lesions involvements of certain bacterial agents like *Pasteurella spp.* are suggested. However, the possible role of Mycoplasma and Retrovirus infections cannot be ruled out. It may be mentioned that lung worm infection either with *Dictyocaulus spp.* or *Protostrongylus spp.* was not detected in any of this pneumonic cases. Under the circumstances, in order to ascertain the etiological factors associated with caprine pneumonia in Bangladesh detailed microbial studies are needed.

This study recorded higher rate of mortality in female animals due to various diseases. The reasons of more susceptibility of female animals to different diseases are not always clear. However, it may be mentioned that special care and improved feeds were given to the male goats as they were used for semen collection. Under the circumstances, the well nourished male animals may be less susceptible to the attack of pathogenic agents. Moreover hormonal effects could be another factor which cause more susceptible to diseases in female animal than male.

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