

Article

Pathoprevalence of infectious diseases of goat emphasizing on endoparasitic lesions at Dinajpur Sadar

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Received: 07 June 2017/Accepted: 18 June 2017/ Published: 29 June 2017

Abstract: This study was conducted to investigate the pathoprevalence of different infectious diseases of goat at Sadar upazilla of Dinajpur district in Bangladesh. Infectious cases were recorded with respect to breed, sex, age and season from Upazilla Veterinary Hospital and District Veterinary Hospital, Sadar, Dinajpur during July, 2014 to June, 2015 and diagnosis was made on the basis of clinical history, clinical examinations and common laboratory techniques with histopathological examination. A total of 2139 infectious diseases were founded and categorized by the causal agents where the highest prevalence was observed in mixed infectious diseases (46.06%) followed by viral diseases (28.93%), internal parasitic diseases (9.77%), external parasitic diseases (8.42%), bacterial diseases (3.00%), protozoal diseases (2.01%) and lowest was in fungal diseases (1.83%). The prevalence of infectious disease was significantly higher at Jamunapari (55.12%) than Black Bengal (44.88%). Female goats were more susceptible (54.32%) than male (45.68%). The prevalence was varied according to age and highest was in G-1 (45.48%) followed by G-2 (36.48%) and G-3 (17.68%). Summer season (33.60%) was common for infections followed by winter (33.51%) and rainy (32.89%). Most of the internal lesions were produced by the endoparasitic infections which were examined microscopically. These results indicate that, the prevalence of various infectious diseases in the goats was higher at Sadar, Dinajpur thus, there is a need for an appropriate control measures in order to prevent and minimize the loss caused by such diseases and this study may help to develop strategies against the infectious diseases of goat.

Keywords: pathoprevalence; infectious diseases; goat; clinical examination; gross and histopathology

1. Introduction

Goat is one of the most important livestock species in Bangladesh and particularly useful for low-income farmers, landless labors and distress women, who can't effort to rare cattle, hence, goat is called "the cow of poor people". In Bangladesh, at present, the approximate number of goats is 25.20 million (DLS, 2013). More than 90% of the total goat population comprises of Black Bengal Goat, reputed for their prolificacy, fertility, early sexual maturity, adaptability to hot humid conditions and superior quality meat and skin (Devendra and Burns, 1983; Hussain, 1993; Amin *et al.*, 2001) and the remaining ones include the Jamunapari and their crosses. Goat usually suffer from many diseases of infectious and non infectious in origin (Singh and Prasad, 2008). However, some infectious diseases are presently become a great threat to these animals survival in Bangladesh. Infectious diseases are disorders caused by organisms such as bacteria, viruses, fungi or parasites. The occurrence of diseases is an important factor which influences the productivity and economy of goat farming. Diseases in goats result in mortality and morbidity losses, resulting in lower production. Several

studies (Paliwal *et al.*, 1978; Krishna *et al.*, 1979; Chauhan *et al.*, 1982; Chatterjee and Dey, 1992) have shown that on an average 20 % of kids and 10 % of adult goats die each year.

Although, different studies have been carried out in various part of Bangladesh, but limited attempt have been taken to study the prevalence of infectious diseases in Dinajpur district. However, over the last some decades, there are tremendous changes in the climates, life styles of people and husbandry practices of livestock all over the Bangladesh. Considering these facts, present study was undertaken to study the prevalence of different infectious diseases of goats in Dinajpur district along with variation in different breed, their sex and environmental factors and line out the gross lesions of different organs with the merit of individual diseases with histopathology of affected organs collected from suspected goat with endoparasitic diseases.

2. Materials and Methods

2.1. Study area and period

The throughout investigation of goat diseases were performed in Sadar Upazilla and the detailed laboratory examination were carried out in the Department of Pathology and Parasitology under the Faculty of Veterinary and Animal Science (VAS) of HSTU, Dinajpur, Bangladesh during the period of July, 2014 to June, 2015.

2.2. Sampling and data processing

During this study period a total of 2,139 goats of different breed, sex and age were included in this study. The affected goats were recorded, organized under groups and seasons. Collected data were systematically arranged and analyzed statistically by using Statistical Package for Social Science (SPSS) software 17.0 version (T- test and Chi-square test).

2.3. Clinical examination

The general clinical findings are noted during submitting and registration in patient register for diagnosis and treatment purposes. The characteristic clinical features were recorded during the physical visit and the farmers and owner complains were also emphasized. Examination of different parts and systems of the body of sick animals were performed by using the procedure of palpation, percussion, auscultation, needle puncture and walking of animals.

2.4. Coprological examination

Coprological examination was performed making a direct smear in glass slide and examined under microscope using various objects.

2.5. Pathological Examination

The dead goats were received for necropsy findings using a standard method. Gross morbid lesions were recorded and the samples of affected organs were collected carefully, preserved at 10% formaline, processed for histopathological examination (Luna, 1968) and stained with H&E stain with a standard method. The slides were examined under microscope and findings were recorded carefully (Luna, 1968).

2.6. Diagnosis of diseases

The diseases of goats were diagnosed basically based on interlinked epidemiological factors (breed, sex, age and season), general clinical findings, coprologic and pathologic features during examination.

3. Results

3.1. Epidemiological Findings

Table 1 have shown that, the infectious diseases found throughout the study were categorized according to the causal agents into viral, bacterial, protozoal, fungal, external parasitic, internal parasitic and mixed infectious diseases and the highest prevalence was observed in mixed infectious diseases (46.06%) followed by viral diseases (28.93%), internal parasitic diseases (9.77%), external parasitic diseases (8.42%), bacterial diseases (3.00%), protozoal diseases (2.01%) and lowest was in fungal diseases (1.83%). PPR (28.56%) was most commonly founded infection among the viral diseases. In bacterial diseases prevalence of infectious arthritis was (1.50%) was higher than others. In the category of fungal infection, dermatophytosis (1.83%) was common. Under the protozoal infection (1.59%) cases of coccidiosis was founded, among a large number of external parasitic diseases (5.75%) cases of lice infestation which was higher and from internal parasitic diseases the higher prevalence was in mixed internal helminth (9.12%). In the mixed infectious diseases (17.67%) cases of upper respiratory tract infection was most common.

Overall prevalence of infectious diseases of goat was statistically higher in Jamunapari (55.12%) than the Black Bengal (44.88%). In most of the cases like viral diseases, bacterial diseases, protozoal infection, external parasitic Diseases, internal parasitic diseases and mixed infectious diseases commonly higher in Jamunapari breed (16.22%, 1.97%, 1.21%, 5.47%, 5.24% and 24.36% respectively) than Black Bengal (12.71%, 1.03%, 0.80%, 2.95%, 4.53% and 21.68% respectively) but only the fungal diseases were common in Black Bengal (1.18%) than Jamunapari (0.65%) (Table 2).

The observation throughout the study showed that the overall prevalence of infections was significantly higher in females (54.32%) than male (45.68%). In case of viral infection female (15.34%) were commonly affected than male (13.60%), prevalence was relatively higher in female (1.64%) than male (1.36%) also in bacterial infection. In both external parasitic diseases and internal parasitic diseases, prevalence was higher in female (5.32% and 5.33%) than male (3.10% and 4.44%) and also the prevalence of mixed infectious diseases was comparatively higher in female (24.73%) than male (21.31%) but only the protozoal diseases were most commonly affected the male (1.40%) than female (0.61%) (Table 3).

Result showed that prevalence of infectious diseases in goats were relatively higher in G-1 i.e. the age group of 0-12 months (45.48%) followed by lower in G-2 aged with 13-24 months (36.84%) and G-3 aged >24 months (17.68%). Viral diseases were relatively higher in G-1 (16.03%), followed by G-2 (8.04%) and G-3 (4.86%) and bacterial diseases were also higher in G-1 (1.40%) then G-2 (1.12%) and G-3 (0.48%) like these in protozoal infections, prevalence was relatively higher in G-1 (1.03%) than G-2 (0.84%) and G-3 (0.14%) but prevalence of fungal infection was higher in the G-2 (1.08%) than two other Groups, G-1 (0.61%) and G-2 (0.14%). Prevalence of both external parasitic infestation and internal parasitic infestation was also comparatively higher in G-2 (4.11% and 5.43%) than G-1 (2.81% and 2.28%) and G-3 (1.50% and 2.06%). Mixed infectious diseases were comparatively higher in G-1 (21.32%) than G-2 (16.32%) and G-3 (8.50%) (Table 4).

Season related prevalence of infectious diseases in goats has showed in Table 5 and the result showed that the prevalence of infectious diseases in goats was relatively equal in all the seasons like rainy (32.89%), winter (33.51%) and summer (33.60%). Prevalence of viral diseases were relatively higher in rainy season (10.57%), followed by summer (9.30%) and winter (9.06%) and prevalence of bacterial diseases was also higher in winter (1.31%) followed by rainy (0.94%) and summer (0.75%). In protozoal infections, prevalence was relatively equal in all seasons like in rainy (0.66%), winter (0.65%) and summer (0.70%) but Prevalence of both external parasitic infestations and internal parasitic infestation was comparatively higher in summer (3.74% and 3.69%) than winter (3.18% and 3.51%) and rainy (1.50% and 2.57%) and finally the prevalence of mixed infectious diseases was comparatively higher in rainy season (16.32%) followed by summer (14.95%) and winter (14.77%) (Table 5).

3.2. General clinical findings

3.2.1. Viral diseases

In Pesti des Petits Ruminants (PPR), common clinical findings were high fever, sneezing, coughing, dyspnoea, serous or mucopurulent ocular and nasal discharge, dullness, erosive stomatitis, diphtheretic plaques on oral mucosa, diarrhea mixed with blood and mucus. In Contagious Ecthyma (Sour Mouth) the clinical signs were pastular and scabby lesions on muzzle, nostrils, lips, coronets, ears, anus, vulva, prepuce and sloughing of the affected epidermal layers.

3.2.2. Bacterial diseases

Infectious Arthritis characterized by swelling in one or more joints, lameness, fever, occasional chills. Foot Rot revealed with the clinical signs of lameness with there were elevated body temperature, swelling of the foot, and separation of the skin. In Tetanus common signs were muscle and limbs stiffness, drooping eyelids, lock jaw, erect ears and tail, changed voice and inability to eat or drink, unsteady gait and convulsion. Death with protrusion of tongue.

3.2.3. Fungal diseases

Dermatophytosis (Ringworm) was signed by circular lesions with incomplete alopecia and thickened, flaky, skin with gray/white crust formation in the affected areas.

3.2.4. Protozoal diseases

Coccidiosis was diagnosed by the signs of persistent diarrhea containing blood and mucus with imappetance, weight lose, dehydration, rough hair coat and straining attempt to pass feces Babeiosis was recognized by dark reddish brown urine with high fever, imappetance, dyspnoea, and anaemia.

Table 1. Prevalence of infectious diseases of goats with respect to breed, sex, age and seasons.

Infectious cases	Breed		Sex		Age			Season				Total and prevalence	%
	JP	BB	Male	Female	0-12 months (G-1)	13-24 months (G-2)	>24 months (G-3)	Rainy Oct)	Winter (Jul-Feb)	(Nov-Summer (mar-Jun)			
Viral diseases	347 (16.22)[§]	272 (12.71)	291 (13.60)	328 (15.34)	343 (16.03)	172 (8.04)	104 (4.86)	226 (10.57)	174 (9.06)	199 (9.30)	619 (28.93)		
PPR	341(15.94)	270(12.62)	287(13.41)	324(15.15)	341 (15.94)	170(7.95)	100(4.67)	226 (10.57)	186(8.69)	199 (9.30)	611 (28.56)		
Contagious Ecthyma	6 (0.28)	2 (0.09)	4 (0.19)	4 (0.19)	2 (0.09)	2 (0.09)	4(0.19)	0 (0)	8 (0.37)	0 (0)	8 (0.37)		
Bacterial diseases	42 (1.97)	22 (1.03)	29 (1.36)	35 (1.64)	30 (1.40)	24 (1.12)	10 (0.48)	20 (0.94)	28 (1.31)	16 (0.75)	64 (3.00)		
Infectious Arthritis	21 (0.98)	11 (0.52)	16 (0.75)	16 (0.75)	18 (0.84)	10 (0.47)	4 (0.19)	7 (0.33)	15 (0.70)	10 (0.47)	32 (1.50)		
Foot rot	13 (0.62)	3 (0.14)	7 (0.33)	9 (0.42)	4 (0.19)	8 (0.37)	4 (0.19)	10 (0.47)	6 (0.28)	0 (0)	16(0.75)		
Tetanus	8 (0.37)	8 (0.37)	6 (0.28)	10 (0.47)	8 (0.37)	6 (0.28)	2 (0.10)	3 (0.14)	7 (0.33)	6 (0.28)	16 (0.75)		
Fungal diseases	14 (0.65)	25(1.18)	10 (0.47)	29 (1.36)	13 (0.61)	23 (1.08)	3 (0.14)	7 (0.33)	22 (1.03)	10 (0.47)	39 (1.83)		
Dermatophytosis	14 (0.65)	25(1.18)	10 (0.47)	29 (1.36)	13 (0.61)	23 (1.08)	3 (0.14)	7 (0.33)	22 (1.03)	10 (0.47)	39 (1.83)		
Protozoal diseases	26 (1.21)	17 (0.80)	30 (1.40)	13 (0.61)	22 (1.03)	18 (0.84)	3 (0.14)	14 (0.66)	14(0.65)	15 (0.70)	43 (2.01)		
Coccidiosis	21 (0.98)	13 (0.61)	27 (1.26)	7 (0.33)	22 (1.03)	12 (0.56)	0 (0)	13 (0.61)	12 (0.56)	9 (0.42)	34 (1.59)		
Babesiosis	5 (0.23)	4 (0.19)	3 (0.14)	6 (0.28)	0 (0)	6 (0.28)	3 (0.14)	1 (0.05)	2 (0.09)	6 (0.28)	9(0.42)		
External parasitic Diseases	117 (5.47)	63 (2.95)	66 (3.10)	114 (5.32)	60 (2.81)	88 (4.11)	32 (1.50)	32 (1.50)	68 (3.18)	80 (3.74)	180 (8.42)		
Lice infestation	82 (3.83)	41 (1.92)	39 (1.82)	84 (3.93)	34 (1.59)	63 (2.95)	26 (1.21)	10 (0.47)	58 (2.71)	55 (2.57)	123 (5.75)		
Scabies /Mange mite	16 (0.75)	11 (0.51)	13 (0.61)	14 (0.65)	16 (0.75)	10 (0.46)	1 (0.05)	7 (0.33)	9 (0.42)	11 (0.51)	27 (1.26)		
Myasis	12 (0.56)	7 (0.33)	11 (0.52)	8 (0.37)	9 (0.42)	7 (0.33)	3 (0.14)	5 (0.23)	0 (0)	14(0.66)	19 (0.89)		
Mite infestation	4 (0.19)	3 (0.14)	2 (0.10)	5 (0.23)	1(0.05)	5 (0.23)	1 (0.05)	6 (0.28)	1 (0.05)	0 (0)	7 (0.33)		
Tick infestation	3 (0.14)	1 (0.05)	1 (0.05)	3(0.14)	0 (0)	3 (0.14)	1 (0.05)	4 (0.19)	0 (0)	0 (0)	4 (0.19)		
Internal parasitic Diseases	112 (5.24)	97 (4.53)	95 (4.44)	114 (5.33)	49 (2.28)	116 (5.43)	44 (2.06)	55 (2.57)	75 (3.51)	79 (3.69)	209 (9.77)		
Mixed Internal Helminth	103(4.82)	92 (4.30)	86 (4.02)	109 (5.10)	45 (2.10)	110 (5.16)	40 (1.87)	54 (2.52)	62 (2.90)	79 (3.69)	195 (9.12)		
Gid disease	6 (0.28)	5 (0.23)	8 (0.37)	3 (0.14)	2 (0.09)	5 (0.23)	4 (0.19)	1 (0.05)	10 (0.47)	0 (0)	11 (0.51)		
Ascariasis	2 (0.09)	0 (0)	0 (0)	2 (0.09)	2 (0.09)	0 (0)	0 (0)	0 (0)	2 (0.09)	0 (0)	2 (0.09)		
Filariasis	1 (0.05)	0 (0)	1 (0.05)	0 (0)	0 (0)	1 (0.05)	0 (0)	0 (0)	1 (0.05)	0 (0)	1(0.05)		
Mixed infectious Diseases	521 (24.36)	464 (21.68)	457 (21.31)	528 (24.73)	456 (21.32)	347 (16.22)	182 (8.50)	349 (16.32)	316 (14.77)	320 (14.95)	985 (46.04)		
Upper RTI	195 (9.12)	183 (8.54)	193 (9.02)	185 (8.65)	214 (10.00)	110 (5.14)	54 (2.52)	123 (5.75)	123 (5.75)	132 (6.17)	378 (17.67)		
Pneumonia	135 (6.31)	135(6.31)	140 (6.54)	130 (6.08)	158 (7.39)	83 (3.88)	29 (1.35)	115 (5.38)	94 (4.39)	61 (2.85)	270 (12.62)		
Infectious Diarrhoea	55 (2.57)	34 (1.59)	51 (2.38)	38 (1.78)	47 (2.20)	37 (1.73)	5 (0.23)	28 (1.31)	32 (1.50)	29 (1.35)	89 (4.15)		
Metritis	39 (1.82)	41 (1.92)	0 (0)	80 (3.74)	0 (0)	36 (1.68)	44 (2.06)	38 (1.78)	20 (0.93)	22 (1.03)	80 (3.74)		
Dermatitis	32 (1.50)	25 (1.17)	35 (1.64)	22 (1.03)	26 (1.22)	25 (1.17)	6 (0.28)	16 (0.75)	9 (0.42)	32 (1.50)	57 (2.67)		
Mastitis	28 (1.31)	21 (0.98)	0 (0)	49 (2.29)	0 (0)	30 (1.40)	19 (0.89)	11 (0.51)	18 (0.84)	20 (0.93)	49 (2.29)		
UTI	22 (1.03)	18 (0.84)	21 (0.98)	19 (0.89)	2 (0.09)	19 (0.89)	19 (0.89)	11 (0.51)	5 (0.23)	24 (1.12)	40 (1.87)		
Keratoconjunctivitis	15 (0.70)	7 (0.33)	16 (0.75)	6 (0.28)	9 (0.42)	7 (0.33)	6 (0.28)	7 (0.33)	15 (0.70)	0 (0)	22 (1.03)		
Total =	1179 (55.12)	960 (44.88)	978 (45.68)	1161(54.32)	973 (45.48)	788 (36.84)	378 (17.68)	703 (32.89)	717 (33.51)	719 (33.60)	2139 (100)		

JP= Jamunapari, BB= Black Bengal; §Number in the parenthesis indicates percent prevalence, PPR= Pesti des Petits Ruminants, TI=Respiratory Tract Infection, UTI= Urinary Tract Infection, G= Group

Table 2. Breed related prevalence of infectious diseases in goats at Dinajpur Sadar.

Infectious cases	Breed		t- value
	JP	BB	
Viral diseases	347 (16.22)	272 (12.71)	
PPR	341 (15.94)	270 (12.62)	5.07*
Contagious Ecthyma	6 (0.28)	2 (0.09)	0.67
Bacterial diseases	42(1.97)	22 (1.03)	
Infectious Arthritis	21 (0.98)	11 (0.52)	1.07
Foot rot	13 (0.62)	3 (0.14)	0.02
Tetanus	8 (0.37)	8 (0.37)	0.01
Fungal diseases	14 (0.65)	25 (1.18)	
Dermatophytosis	14 (0.65)	25 (1.18)	1.02
Protozoal diseases	26 (1.21)	17 (0.80)	
Coccidiosis	21 (0.98)	13 (0.61)	0.67
Babesiosis	5 (0.23)	4 (0.19)	0.39
External parasitic Diseases	117 (5.47)	63 (2.95)	
Lice infestation	82 (3.83)	41 (1.92)	1.89
Scabies /Mange mite	16 (0.75)	11 (0.51)	0.05
Myiasis	12 (0.56)	7 (0.33)	0.02
Mite infestation	4 (0.19)	3 (0.14)	0.09
Tick infestation	3 (0.14)	1 (0.05)	0.01
Internal parasitic Diseases	112 (5.24)	97 (4.53)	
Mixed Internal Helminth	103 (4.82)	92 (4.30)	1.05
Gid disease	6 (0.28)	5 (0.23)	1.05
Ascariasis	2 (0.09)	0 (0)	0.05
Filariasis	1 (0.05)	0 (0)	0.05
Mixed infectious Diseases	521 (24.36)	464 (21.68)	
Upper RTI	195 (9.12)	183 (8.54)	1.08
Pneumonia	135 (6.31)	135 (6.31)	0.01
Infectious Diarrhoea	55 (2.57)	34 (1.59)	1.09
Metritis	39 (1.82)	41 (1.92)	2.07
Dermatitis	32 (1.50)	25 (1.17)	0.57
Mastitis	28 (1.31)	21 (0.98)	2.07
UTI	22 (1.03)	18 (0.84)	0.01
Keratoconjunctivitis	15 (0.70)	7(0.33)	0.06
Total =	1179 (55.12)	960 (44.88)	6.02**

JP= Jamunapari, BB= Black Bengal, PPR= Pesti des Petits Ruminants, RIT= Respiratory Tract Infection, UTI= Urinary Tract Infection; ** = Significant at (P<0.05)

3.2.5. External parasitic diseases

Lice Infestation was manifested by scratching, rubbing, biting of infested areas and broken fibers. Tick infestation were characterized with the formation of papules, pustules, ulceration and alopecia particularly in the skin of ears, face, neck, groin, digital limbs, tail and other areas of the body. Scabies was characterized with severe etching, varying degrees of dermatitis with extensive hair loss around the muzzle, eyes, and ears; lesions on the inner thighs extending to the hocks, brisket, underside and axillary region. Myiasis was characterized by maggot found in the affected area with oozing of blood from the wound.

3.2.6. Internal parasitic diseases

Gid was diagnosed by the clinical signs of circling, head shaking, soft skull, skin over the bone become shrinkage and cyst identification. The clinical signs of mixed internal helminth infestation were diarrhoea, dehydration, anorexia, emaciation, abdominal distention and pale visible mucous membrane to a large extent as where a very few infected goats suffered from 'bottle jaw'.

Table 3. Sex related prevalence of infectious diseases in goats at Dinajpur Sadar.

Infectious cases	Sex		t- value
	Male	Female	
Viral diseases	291 (13.60)	328 (15.34)	
PPR	287 (13.41)	324 (15.15)	3.02
Contagious Ecthyma	4 (0.19)	4 (0.19)	0.00
Bacterial diseases	29 (1.36)	35 (1.64)	
Infectious Arthritis	16 (0.75)	16 (0.75)	0.01
Foot rot	7(0.33)	9 (0.42)	0.02
Tetanus	6 (0.28)	10 (0.47)	0.12
Fungal diseases	10 (0.47)	29 (1.36)	
Dermatophytosis	10 (0.47)	29 (1.36)	0.02
Protozoal diseases	30 (1.40)	13 (0.61)	
Coccidiosis	27 (1.26)	7 (0.33)	0.01
Babesiosis	3 (0.14)	6 (0.28)	0.03
External parasitic Diseases	66 (3.10)	114 (5.32)	
Lice infestation	39 (1.82)	84 (3.93)	1.01
Scabies /Mange mite	13 (0.61)	14 (0.65)	0.12
Myasis	11 (0.52)	8 (0.37)	0.98
Mite infestation	2 (0.10)	5 (0.23)	2.08
Tick infestation	1 (0.05)	3 (0.14)	0.01
Internal parasitic Diseases	95 (4.44)	114 (5.33)	
Mixed Internal Helminth	86 (4.02)	109 (5.10)	1.09
Gid disease	8 (0.37)	3 (0.14)	0.20
Ascariasis	0 (0)	2 (0.09)	0.02
Filariasis	1(0.05)	0 (0)	0.01
Mixed infectious Diseases	457 (21.31)	528 (24.73)	
Upper RTI	193 (9.02)	185 (8.65)	0.10
Pneumonia	140 (6.54)	130 (6.08)	0.12
Infectious Diarrhoea	51 (2.38)	38 (1.78)	0.01
Metritis	0 (0)	80 (3.74)	2.08
Dermatitis	35 (1.64)	22 (1.03)	0.02
Mastitis	0 (0)	49 (2.29)	0.02
UTI	21 (0.98)	19 (0.89)	0.23
Keratoconjunctivitis	16 (0.75)	6 (0.28)	0.12
Total =	97 (45.68)	1161(54.32)	6.09*

PPR= Pesti des Petits Ruminants, RIT= Respiratory Tract Infection, UTI= Urinary Tract Infection;* = Significant at (P<0.05)

3.2.7. Mixed infectious diseases

Upper respiratory tract infection was manifested by clinical signs of nasal discharge, sneezing, coughing, dyspnoea, elevated temperature and loss of appetite. The nasal discharge came out from one or both nostrils and the nasal passages were blocked in most cases. Pneumonia was recognized by coughing, rapid breathing, dyspnoea, nasal and ocular discharge, moderate fever, inappetance, weight loss, lethargy and dullness. In infectious diarrhoea, clinical signs were profuse amounts of liquid feces with dehydration, weakness, depression and recumbence. Sometime feces foul smelled containing blood, fibrin and copious amounts of mucus. Clinical signs of metritis were foul smelling vaginal discharge without pus frequently accompanied by fever. In dermatitis signs were mild erythema, scaling and alopecia, in some extend mild pyoderma founded. Mastitis was characterized by the signs of clots and/or blood in the milk, reduced milk yield, hot, red, swollen, hard and painful udder. Fever and anorexia was common. In urinary tract infection common clinical signs were frequent urination, straining to urinate, blood in the urine, excessive licking of the genitals. Infectious Keratoconjunctivitis (Pinkeye, Infectious ophthalmia) was revealed by clinical sign of conjunctivitis, lacrimation with varying degrees of corneal opacity, ulceration and blepharospasm.

3.3. Coprological findings

Eggs of different endoparasites (*Fasciola* sp., *ascaria* sp., *Schistosoma* sp. and *O. columbianum*) were founded through the Coprological Findings (Figure 1, A).

Table 4. Age related prevalence of infectious diseases in goats at Dinajpur Sadar.

Infectious cases	Age		
	G-1 (0-12 months)	G-2 (13-24 months)	G-3 (>24 months)
Viral diseases	343 (16.03)	172 (8.04)	104 (4.86)
PPR	341 (15.94)	170 (7.95)	100 (4.67)
Contagious Ecthyma	2 (0.09)	2(0.09)	4 (0.19)
Bacterial diseases	30 (1.40)	24 (1.12)	10 (0.48)
Infectious Arthritis	18 (0.84)	10 (0.47)	4 (0.19)
Foot rot	4 (0.19)	8 (0.37)	4 (0.19)
Tetanus	8 (0.37)	6 (0.28)	2 (0.10)
Fungal diseases	13 (0.61)	23 (1.08)	3 (0.14)
Dermatophytosis	13 (0.61)	23 (1.08)	3 (0.14)
Protozoal diseases	22 (1.03)	18 (0.84)	3 (0.14)
Coccidiosis	22 (1.03)	12 (0.56)	0 (0)
Babesiosis	0 (0)	6 (0.28)	3 (0.14)
External parasitic Diseases	60 (2.81)	88 (4.11)	32 (1.50)
Lice infestation	34 (1.59)	63 (2.95)	26 (1.21)
Scabies /Mange mite	16 (0.75)	10 (0.46)	1 (0.05)
Myasis	9 (0.42)	7 (0.33)	3 (0.14)
Mite infestation	1(0.05)	5 (0.23)	1 (0.05)
Tick infestation	0 (0)	3 (0.14)	1 (0.05)
Internal parasitic Diseases	49 (2.28)	116 (5.43)	44 (2.06)
Mixed Internal Helminth	45 (2.10)	110 (5.16)	40 (1.87)
Gid disease	2 (0.09)	5 (0.23)	4 (0.19)
Ascariasis	2 (0.09)	0 (0)	0 (0)
Filariasis	0 (0)	1 (0.05)	0 (0)
Mixed infectious Diseases	456 (21.32)	347 (16.22)	182 (8.50)
Upper RTI	214 (10.00)	110 (5.14)	54 (2.52)
Pneumonia	158 (7.39)	83 (3.88)	29 (1.35)
Infectious Diarrhoea	47 (2.20)	37 (1.73)	5 (0.23)
Metritis	0 (0)	36 (1.68)	44 (2.06)
Dermatitis	26 (1.22)	25 (1.17)	6 (0.28)
Mastitis	0 (0)	30 (1.40)	19 (0.89)
UTI	2 (0.09)	19 (0.89)	19 (0.89)
Keratoconjunctivitis	9 (0.42)	7 (0.33)	6 (0.28)
Total =	973 (45.48)	788 (36.84)	378 (17.68)
Chi-square value	0.171 NS		

PPR= Pesti des Petits Ruminants, RIT= Respiratory Tract Infection, UTI= Urinary Tract Infection; G=Group; NS = Not Significant at (p>0.05)

Table 5. Season related prevalence of infectious diseases in goats at Dinajpur Sadar.

Infectious cases	Season		
	Rainy (Jul-Oct)	Winter (Nov-Feb)	Summer (mar-Jun)
Viral diseases	226 (10.57)	174 (9.06)	199 (9.30)
PPR	226 (10.57)	186 (8.69)	199 (9.30)
Contagious Ecthyma	0 (0)	8 (0.37)	0 (0)
Bacterial diseases	20 (0.94)	28 (1.31)	16 (0.75)
Infectious Arthritis	7 (0.33)	15 (0.70)	10 (0.47)
Foot rot	10 (0.47)	6 (0.28)	0 (0)
Tetanus	3 (0.14)	7 (0.33)	6 (0.28)
Fungal diseases	7 (0.33)	22 (1.03)	10 (0.47)
Dermatophytosis	7 (0.33)	22 (1.03)	10 (0.47)
Protozoal diseases	14 (0.66)	14 (0.65)	15 (0.70)
Coccidiosis	13 (0.61)	12 (0.56)	9 (0.42)
Babesiosis	1 (0.05)	2 (0.09)	6 (0.28)
External parasitic Diseases	32 (1.50)	68 (3.18)	80 (3.74)
Lice infestation	10 (0.47)	58 (2.71)	55 (2.57)
Scabies /Mange mite	7 (0.33)	9 (0.42)	11 (0.51)
Myasis	5 (0.23)	0 (0)	14 (0.66)
Mite infestation	6 (0.28)	1 (0.05)	0 (0)
Tick infestation	4 (0.19)	0 (0)	0 (0)
Internal parasitic Diseases	55 (2.57)	75 (3.51)	79 (3.69)
Mixed Internal Helminth	54 (2.52)	62 (2.90)	79 (3.69)
Gid disease	1 (0.05)	10 (0.47)	0 (0)
Ascariasis	0 (0)	2 (0.09)	0 (0)
Filariasis	0 (0)	1 (0.05)	0 (0)
Mixed infectious Diseases	349 (16.32)	316 (14.77)	320 (14.95)
Upper RTI	123 (5.75)	123 (5.75)	132 (6.17)
Pneumonia	115 (5.38)	94 (4.39)	61 (2.85)
Infectious Diarrhoea	28 (1.31)	32 (1.50)	29 (1.35)
Metritis	38 (1.78)	20 (0.93)	22 (1.03)
Dermatitis	16 (0.75)	9 (0.42)	32 (1.50)
Mastitis	11 (0.51)	18 (0.84)	20 (0.93)
UTI	11 (0.51)	5 (0.23)	24 (1.12)
Keratoconjunctivitis	7 (0.33)	15 (0.70)	0 (0)
Total =	703 (32.89)	717 (33.51)	719 (33.60)
Chi-square test	0.448 NS		

PPR= Pesti des Petits Ruminants, RIT= Respiratory Tract Infection, UTI= Urinary Tract Infection; NS = Not Significant at (p>0.05)

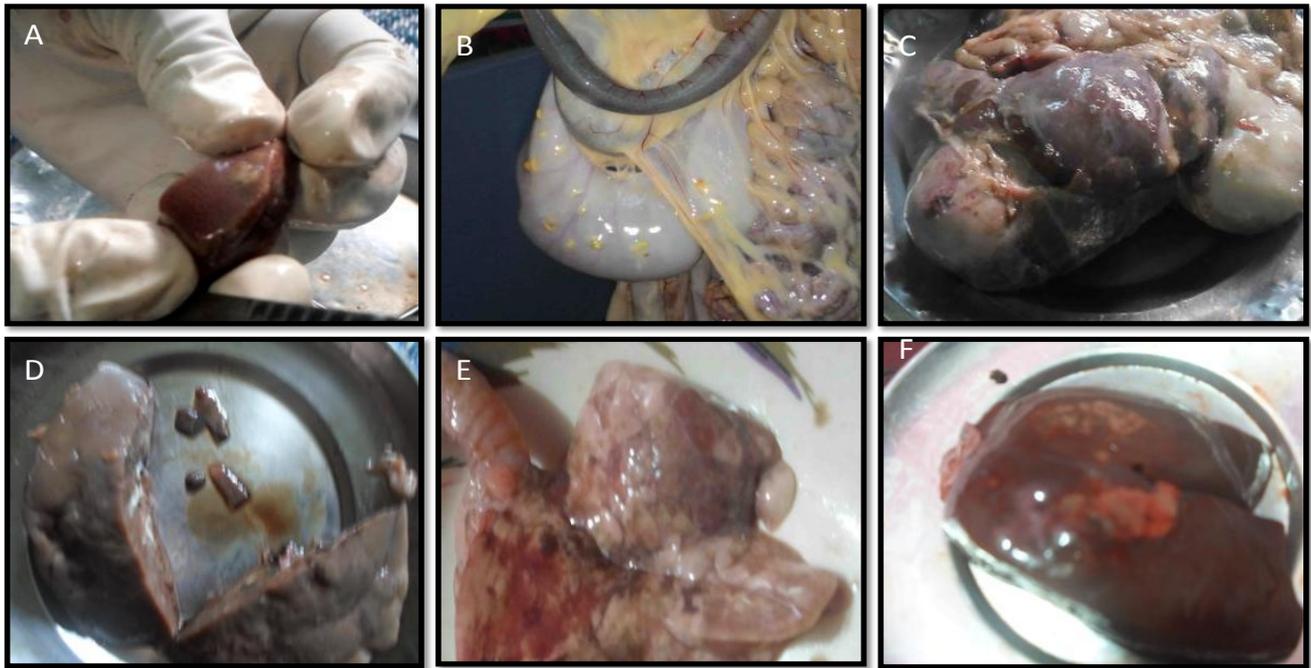


Figure 1. A. Ascariasis characterized by showing pale spot which extended shortly in liver parenchyma, B. *O. columbianum* infection showing hard, raised and yellowish nodule formation in themucosa of colon, C. Fascioliasis characterized with acute inflammation with fibrosis of liver , D. adult fluke comes out from liver in fascioliasis, E. Hydatidosis disease signed with grape shaped cyst formation in the lung and F. Cystic degeneration in the liver parenchyma in Hydatidosis

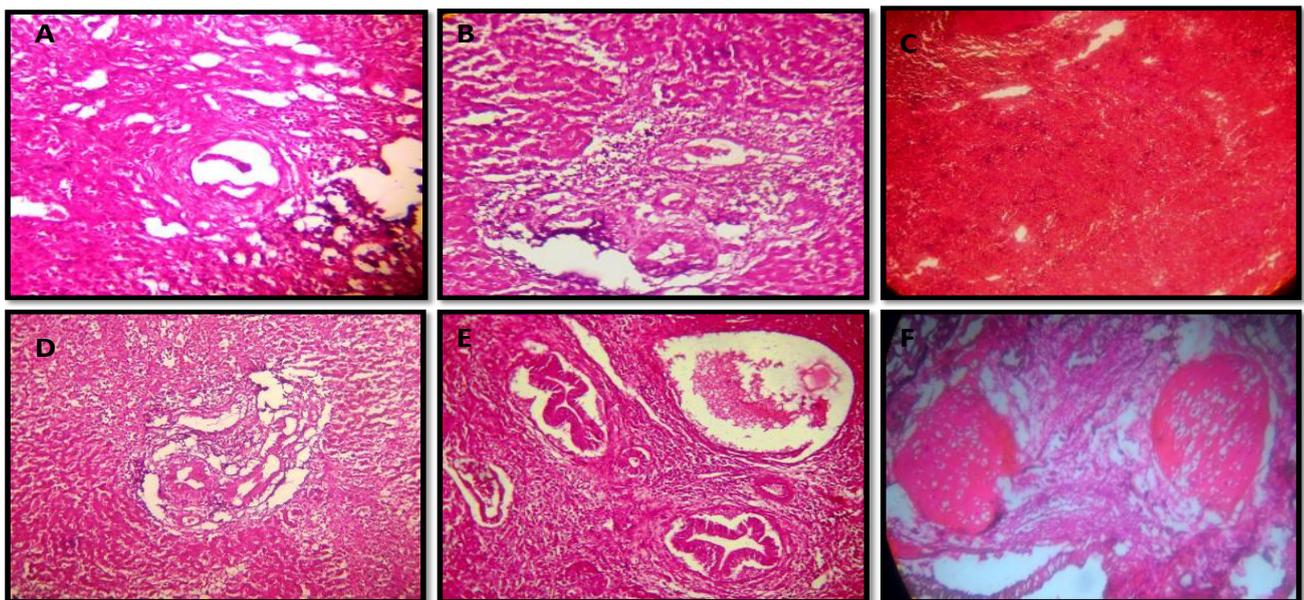


Figure 2. Microscopic lesions lesions of Endoparasitic Infestation, A. Ascariasis showing parasitic granuloma composed of longitudinal section of larva, surrounded by lymphocytic proliferation with fibrosis in Liver, B. Schistosomiasis Showing fibrosis infiltrated with mononuclear inflammatory cells around the egg in portal area in liver, C. Haemosiderin pigmentation throughout the spleen; Schistosomiasis , D. Liver showing hydatid scolex in the central vein surrounded by fibrosis with severe scattered of inflammatory cells surrounding the fertile cyst; Hydatidosis, E. Liver showing multiple cross section of adult worm, thickened blood vessel due to fibrosis and debris of worm in the intrahepatic bile duct with infiltration of inflammatory cells, Fascioliasis F . Daughter cyst having scolex and germinal lining with fibrosis in lung parenchyma causing destruction of pulmonary alveoli Hydatidosis. (H and E, 10X),

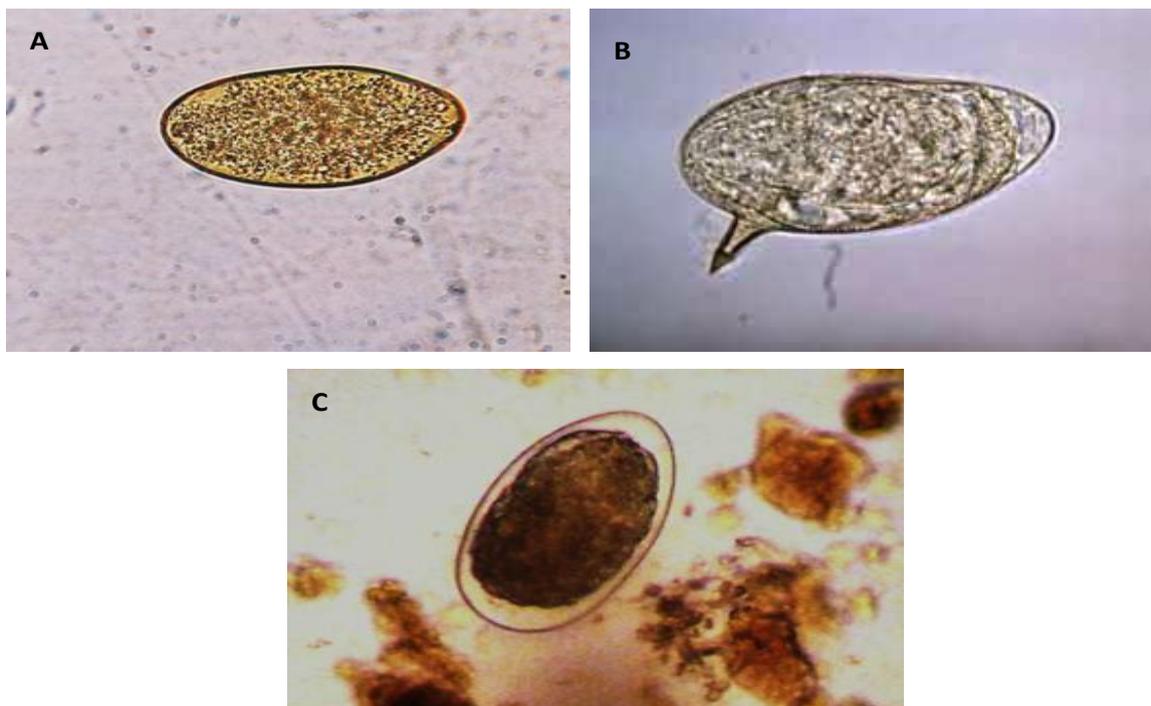


Figure 3. A. Egg of *F. gigantica* (100X), B. Egg of *S. indicum* (100X), C. Egg of *Oesophagostomum* spp.(100X)

3.4. Pathological lesions of endoparasitic diseases

In ascariasis, grossly there was pale spot which extended shortly in liver parenchyma (Figure1) and microscopically we found parasitic granuloma composed of longitudinal section of larva in liver parenchyma surrounded by lymphocytic proliferation with fibrosis.

Grossly nodule formation was commonly observed in the mucosa at any point from the pylorus to the anus at *O. columbianum* infection. Nodules were hard, raised, and slightly yellowish in color (Figure 1, B).

In fascioliasis the gross pathological changes of the liver in chronic fascioliasis were increased size of the organ due to inflammatory changes in the parenchyma and fibrosis of the bile ducts containing adult flukes. In acute form, the livers were slightly swollen or enlarged with rounded edges and the color became paler than normal with numerous small and large hemorrhagic patches scattered over the parietal surface of all the lobes (Figure 1,C) and microscopically, there were multiple cross section and longitudinal section of adult worm, diffused fibrous connective tissue proliferation which bring pressure atrophy to the adjacent hepatic cells resulting hepatic chirrrosis with mononeuclear inflammatory and lymphocytic proliferation throughout the liver debris of worm in the intrahepatic bile duct with thickened blood vessel due to fibrosis (Figure 2, E).

Hydatid cysts were fluid filled cysts, some up to the size of oranges or grapefruits were founded in the lungs and livers and also in the peritoneal cavity (Figure 1, E and F) and microscopically there were hydatid scolex in the central vein surrounded by fibrosis with severe scattered of inflammatory cells surrounding the fertile cyst and lobular destruction with reactive cell infiltration finally completely autolization of liver (Figure 2, D). In case of lung, microscopically we found multicystic lung and cysts containing several scolices with germinal lining with fibrosis in lung parenchyma causing destruction of pulmonary alveoli, and in the spleen there were scolex in the parenchyma with huge reactive cell infiltration with diffused edema in trabicule (Figure 2, F).

In schistosomiasis the commonly founded lesions were, the liver was firm and pale in color and microscopically there were ova granuloma in the liver with intense infiltration of mononuclear and polymorph nuclear cells in the portal tract and fibrosis around the egg. In Spleen there was hemosiderosis throughout the splenic parenchyma (Figure 2, C).

4. Discussion

Infectious diseases are a global problem and considered as a major obstacle in the health and product performance of livestock specially goats (Nath, 2014). In recent study, a total of 2139 goat records were collected throughout the period from the DVH office and UVH office of Dinajpur. This study found highest

proportional incidence rate in mixed infectious disease (46.04%) followed by viral diseases (28.93%), internal parasitic diseases (9.77%), external parasitic diseases (8.42%), bacterial diseases (3.00%), protozoal diseases (2.01%) and lowest prevalence were in Fungal diseases (1.83%). The result of recent study is more or less similar to Amin (2015) who mentioned viral disease (20.02%), bacterial diseases (17.88%), fungal disease (1.44%), Endo-parasitic diseases (29.27%), ectoparasitic diseases (29.27%), protozoal diseases (4.37%) and others (19.33%) and Alam *et al.* (2015) resulted as viral diseases (11.47%), bacterial diseases (6.55%), (25.20%) endoparasitic diseases and (12.50%) ectoparasitic diseases but slight difference from Pervez *et al.* (2014). The findings of the present study are similar in most cases with the earlier reports but the little more variations might be due to the differences in the sample size, period and place of study, collection method of samples, animals breed and categorization of infections, climatic and managemental factors.

Prevalence of infectious disease were significantly higher (at $p < 0.005$) in Jamunapari (55.12%) than Black Bengal (44.88%) which is not in agreement with Nath *et al.* (2014) who recorded the prevalence of infectious disease was highest at Black Bengal breed (64.23%) and lowest in Jamunapari cross (57.39%), although it is tough to explain the main cause of overall variation but it may be said that, as the native breed, Black Bengal are more resistance against these infectious diseases.

Prevalence of infectious diseases in relation to sex revealed that there were significantly higher females (54.32%) (at $P < 0.05$) infected than the male (45.68%) similar record was found in Nath *et al.* (2014), Parvez *et al.* (2014) and Ali *et al.* (2011). The reasons for higher prevalence of infection in the females can't be explained exactly but it might be assumed that the alternation in the physiological condition of the females during pregnancy, lactation and parturition (hormonal influences) as well as stress leading to immune suppression may be associated with this phenomenon (Lloyd, 1983).

It was revealed that age of the goats had insignificant effect on infectious diseases. Prevalence of infectious diseases in goats was relatively higher in G-1 i.e. the age group of 0-12 months (45.48%) followed by lower in G-2 aged with 13-24 months (36.84%) and G-3 aged >24 months (17.68%) respectively. The findings of the present study similar to Nath *et al.* (2014), and Parvez *et al.* (2014). Although it is very difficult to explain exactly the frequent occurrence of infections in all groups but it may be assumed that the exhausted immune system of adults and underdeveloped immune system of youngs may be responsible for more or less equal prevalence of different infections in all age groups.

From the present study it was revealed that seasonal variation had insignificant effect on infectious diseases. Prevalence of infectious diseases in goats were relatively equal in all the seasons like rainy (32.89%), winter (33.51%) and summer (33.60%), this prevalence is in agreement with the findings of Nath *et al.* (2014) who resulted the occurrence of various infectious diseases were distributed in rainy season (36.43%) followed by winter season (34.94%) and summer season (28.62%). Season wise prevalence indicated that, although the infections were more or less equal in all seasons but in winter season goats were more susceptible for infectious diseases due to the animal gather together in excessive cold environmental condition, resulting easy transmission of infections along with improper management, highest percentage of diseases was found in winter season.

The gross and microscopic lesions of commonly affected endoparasites were studied here and the findings of gross lesions were in agreement with Okoye *et al.* (2015), Abraham and Jude (2014), Talukde *et al.* (2010) and Blutke *et al.* (2010) and the microscopic findings were similar with the findings of Okoye *et al.* (2015), Abraham and Jude (2014) and Borai *et al.* (2013), Se'adawy *et al.* (2012), Blutke *et al.* (2010), Habtamu *et al.* (2013), Kardman (2004), Seed and Nelson (1974) and Hussain (1971).

5. Conclusions

Various Infectious diseases now become a global problem and considered as a major obstacle in the health and product performance of livestock specially goats. For the prevention and control of the diseases, a thorough knowledge about the occurrence of diseases, their epidemiology, pathogenesis and pathology of the diseases are essential. The present pathological investigation and prevalence study on to the infectious disease of goat at Sadar Upazilla in Dinajpur district of Bangladesh and from all these findings it may be concluded that these various infectious diseases appeared as an important cause for hindering the goat rearing in Dinajpur area. Regular vaccination and proper surveillance and monitoring can eradicate those diseases. Veterinary inspection should pay attention for these all farm animals to detect the infectious diseases that may hamper the production of animals and make loss of the farmer. Further studies should be find out the source, distinctive causal agent and histopathology of other infections more than the endoparasitic lesions to find out effective control strategies against specific infections.

Acknowledgements

We are thankful to District Livestock Officer, Upazila Livestock Officer and Veterinary Surgeon of Sadar upazila, Dinajpur for providing all types of logistic supports and the facilities for the conduction of the experiment at the Hospital and also to Ministry of National Science and Technology for selecting as a NST fellow and make a significant cooperation and funding for this experiment.

Conflict of interest

None to declare.

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